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DISADVANTAGED BUSINESS ENTERPRISE AVAILABILITY STUDY

Prepared for the Missouri Department of Transportation

by

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MMC Marsh & McLennan Companies

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I. INTRODUCTION

The Missouri Department of Transportation (MoDOT) commissioned National Economic Research Associates, Inc. (NERA) to perform this study in compliance with United States Department of Transportation (USDOT) regulations.

Missouri has the seventh largest highway and road system in the United States. MoDOT is responsible for the planning, construction, and maintenance of this extensive transportation network, which includes airports, railways, and waterways in addition to a large network of roads and bridges. Between 2000 and 2003, MoDOT construction contract awards averaged about $870 million annually. Each year, 35-40 percent of MoDOT's contracting has been funded by the Federal Highway Administration (FHWA) and the other modal agencies of USDOT.

As a recipient of such funds, MoDOT is required to comply with the regulations pertaining to the USDOT's Disadvantaged Business Enterprise (DBE) Program. The primary concern of the DBE program is to create a level playing field for the utilization of businesses owned by socially and economically disadvantaged persons, including members of certain minority groups and by women, on contracts that are funded in part or in whole by the USDOT.

In 1999, the USDOT adopted a comprehensive revision of the DBE Program.[1] MoDOT must set an overall, annual aspirational percentage goal for DBE participation on its USDOT-assisted contracts that are narrowly tailored to MoDOT's particular circumstances and based on demonstrable evidence of availability—*i.e.* the percentage of relevant businesses owned by minorities and/or women in MoDOT's geographic market area.[2]

The process for determining availability is twofold. First, MoDOT must make a determination of the baseline percentage of firms in its relevant market area that are or could become certified as DBEs. Second, MoDOT must consider other relevant information and make a determination about whether, and if so by how much, the baseline figure should be adjusted upward or downward in order to set an overall goal that is consistent with what would be expected in a market that is race- and sex neutral.[3] This two-step method requires MoDOT to set a DBE goal that

[1] 49 Code of Federal Regulations (CFR), part 26.

[2] 49 CFR § 26.45.

[3] *Ibid*.

prevents under-utilization of DBEs and over-utilization of DBEs to the exclusion of non-DBEs. Under the regulations, if an agency exceeds its overall goal for two consecutive years through the use of contract-specific DBE participation goals, it must reduce its use of contract-specific goals proportionately in the following year and rely more on race- and sex neutral means.[4]

For this study, NERA used minority-owned and women-owned business (MWBE) availability as a proxy for DBE availability. The MWBE and DBE populations have a very high degree of correlation and overlap. There are two differences worth noting, however.

First, to be certified as a DBE a business owner's personal net worth cannot exceed $750,000, exclusive of equity in the owner's primary residence and in the business seeking certification.[5] Hence, not all MWBEs can become DBEs. In practice, however, very few households—especially minority households—have net worth levels in excess of $750,000.[6] Second, it is possible for businesses owned by non-minority males to become certified DBEs if they can establish that they are socially and economically disadvantaged under the regulations.[7] Hence, not all DBEs are necessarily MWBEs. On balance, since so few MWBEs have net worth levels in excess of $750,000 and since a substantial number of businesses owned by socially and economically disadvantaged non-minority males could potentially seek DBE certification (*e.g.*,

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[4] 49 C.F.R. § 26.51(f).

[5] 49 CFR § 26.67.

[6] According to the Federal Reserve's *1993 National Survey of Small Business Finances*, about 6 percent of White-male-owned small businesses, 2.6 percent of White-female-owned small businesses, and 3 percent of non-White-owned small businesses have business equity in excess of $750,000. Further, Census Bureau data show that the median net worth of Black and Hispanic households is much less than the median for White households. Very few Black or Hispanic households have net worths above even $500,000. Only 0.2 percent of Black households and 0.5 percent of Hispanic households have a net worth greater than $500,000—compared to a figure of 4 percent for White households. Overall, the median net worth for White households is approximately seven times higher than that of Black or Hispanic households. (See U.S. Census Bureau, "Percent Distribution of Household Net Worth, by Amount of Net Worth and Selected Characteristics: 1995," INTERNET: http://www.census.gov/hhes/www/wealth/1995/wlth95-4.html and U.S. Census Bureau, "Median Value of Assets for Households, by Type of Asset Owned and Selected Characteristics: 1995," INTERNET: http://www.census.gov/hhes/www/wealth/1995/wlth95-1.html). More recent Federal Reserve Board data also document that the net worth of White households is much greater than that of Black or Hispanic households. The Federal Reserve's *1998 Survey of Consumer Finances* found that the median net worth of non-minority households was $94,900 and the mean net worth was $334,400. For minority households, the median net worth was $16,400 and the mean net worth was $101,700 (See Kennickell, Arthur B., Starr-McCluer, Martha, and Surette, Brian J., "Recent Changes in U.S. Family Finances: Results from the 1998 Survey of Consumer Finances," Federal Reserve Bulletin, January 2000).

[7] 49 CFR § 26.67 and Appendix E.

disabled persons, non-minority residents of Labor Surplus Areas, non-minority residents of HUB Zones), NERA's method may understate DBE availability to a small degree.[8]

NERA's approach to availability measurement reflects USDOT's own compliance advice. According to the USDOT's guidance, "… if you have data about the number of minority and women-owned businesses (regardless of whether they are certified as DBEs) in your market area, or DBEs in your market area that are in other recipients' Directories but not yours, you can supplement your Directory data with this information. *Doing so may provide a more complete picture of the availability of firms to work on your contracts than the data in your Directory alone*."[9]

The remainder of this report is organized as follows. Section II describes the assembly of the contract and subcontracting database and how the relevant markets were defined. Section III describes the methods employed to estimate baseline DBE availability for MoDOT and presents the results of this analysis. Section IV describes the evidence considered concerning adjustment of the baseline availability figures. At MoDOT's request, we report estimates of DBE availability for contracts in construction, consulting, off-systems, and overall.

[8] For ease of exposition, we shall use the term DBE throughout the remainder of the report.

[9] *See* INTERNET: http://osdbuweb.dot.gov/business/dbe/hottips.html (emphasis added). This information was released as official guidance by USDOT. See 49 CFR §26.9.

II. DEFINING THE RELEVANT MARKETS

The first step in estimating DBE availability is to define the relevant markets for MoDOT's federally-assisted contracting. Markets have both a product and a geographic dimension, both of which were considered in constructing our estimates of DBE availability.[10] Once the appropriate markets have been defined, we can estimate the number of businesses present in those markets as well as the number that are owned by minorities or women. Finally, MoDOT contract expenditure data are used to develop dollar-based weights for each relevant industry and county. These weights are combined and then used to calculate weighted average overall DBE availability.[11]

A. Preparing the master contract/subcontract database

In order to identify the product and geographic markets relevant to MoDOT, we assembled a master database of MoDOT's contracting and subcontracting activity. This section describes the three categories of federally-assisted MoDOT contracts included in this master database: (1) construction, (2) consulting, (3) and off-systems. We use data from all three categories to identify the industries in MoDOT's product market and the counties in its geographic market. This section describes the data assembled for each category.

1. Construction

We worked with MoDOT staff to identify all federally-assisted construction contracts awarded from 1997 through late 2003. A total of 1,006 such construction contracts were awarded during that period with a value of more than $4.5 billion. For each contract, we obtained data including the contractor name, contractor DBE status, unique contract identification number, letting date, contract award amount, highway district, county, and federal participation percentage. Additionally, MoDOT's contract files included information on up to 28 distinct first-tier subcontractors or suppliers ("subcontractors") for each contract, including their business name, DBE status, and award amount. MoDOT also provided us with three files containing address and contact information for approved prime contractors, active subcontractors and certified DBE

[10] *See*, for example, Areeda, Phillip, and Louis Kaplow, *Antitrust Analysis: Problems, Text, Cases*, Boston: Little, Brown and Company, 4th Edition, 1988.

[11] Although the primary purpose of the study is the estimation of availability at the statewide level, estimates of DBE availability by MoDOT highway districts are also provided.

contractors. In addition to address and contact information, the latter file also identified the race and sex of the contractor's ownership as well as the type of work it was registered to perform.

Since unique identification numbers for prime contractors and subcontractors were not available in any of these databases, our match-merge process was based on business name. After all contractor and subcontractor names were internally reconciled and match-merged, we cross-referenced them with Dun & Bradstreet, American Business Information, Hoover's Company Records, and other sources in order to assign primary and secondary Standard Industrial Classification (SIC) codes to each contractor and subcontractor. SIC codes were assigned at the four-digit level.[12] We also used these sources to assign city, state and zip code information where not already available from the internal MoDOT data.

2. Consulting

We also worked with MoDOT staff to identify all contracts for engineering, architectural design and other professional consulting services awarded from 2001–2003.[13] We received usable data for 59 contracts or contract addenda executed during that period with an aggregate value of more than $145 million. As with the construction contracts, we received data including the consultant name, unique contract identification number, execution date, contract award amount, and county. Additionally, we received information on up to 11 distinct first-tier sub-consultants for each contract, including their business name, DBE status, and award amount. The consultant records were then match-merged with the contractor address and contact files as previously described. Next, we assigned primary and secondary SIC codes to each consultant and sub-consultant in this database, using the sources identified above as well as descriptions in the internal data concerning the type of work being performed.

3. Off-Systems

A third group of federally-assisted contracts are referred to as "off-systems." These are construction projects typically undertaken by local governments in Missouri but funded in whole or part with federal funds that pass through MoDOT. We received usable data on 73 such off-systems contracts or contract addenda undertaken between 2001-2003 with an aggregate value of

[12] This is the most detailed level included in the SIC system.

[13] Systematic data for this category of contracts was not available prior to 2001.

approximately $49 million.[14] As with the construction and consultant records, we match-merged the off-systems files to the contractor address and contact files using business name as the key field. Contract names were then cross-referenced with the external sources previously listed in order to supplement existing SIC and geographic characteristics.[15]

B. Product Market Definition

We joined construction, consulting, and off-systems databases together to form the master contract and subcontract database used for this study. Based on the SIC codes assigned to each contractor and subcontractor in the master database, we estimated product market weights for 66 four-digit SIC codes in construction, 19 in consulting, and 22 in off-systems. For all three categories, we identified a total of 71 SIC codes. The relevant SIC codes and their associated dollar weights appear below in Tables 1A–1D, respectively.

Although a total of 66 SIC codes were identified in MoDOT's construction contracting market, Table 1A shows that 90 percent of MoDOT construction activities occurs in just nine industries and that one industry, SIC 1611, accounts for over 60 percent of construction activity.

Table 1A. Product Market for MoDOT Construction Contracts

SIC Code	SIC Description	Percentage	Cumulative Percentage
1611	Highway and Street Construction	61.17	61.17
1622	Bridge, Tunnel, and Elevated Highway	13.43	74.60
1771	Concrete Work	4.40	79.00
1794	Excavation Work	2.70	81.69
1623	Water, Sewer, and Utility Lines	1.99	83.68
1791	Structural Steel Erection	1.84	85.52
1629	Heavy Construction, n.e.c.	1.66	87.19
1731	Electrical Work	1.49	88.68
1721	Painting	1.43	90.11
4212	Local Trucking Without Storage	1.14	91.24

[14] Systematic data for this category of contracts was not available prior to 2001.

[15] The off-systems file did not contain subcontractor information for non-DBE firms.

SIC Code	SIC Description	Percentage	Cumulative Percentage
5172	Petroleum & Petroleum Products Wholesalers	0.90	92.14
782	Lawn and Garden Services	0.88	93.03
1542	Nonresidential Construction, n.e.c.	0.85	93.88
1411	Dimension Stone	0.69	94.57
3273	Ready-Mixed Concrete	0.64	95.20
1799	Special Trade Contractors, n.e.c.	0.64	95.84
1541	Industrial Buildings and Warehouses	0.62	96.46
1521	Single-Family Housing Construction	0.45	96.91
7359	Equipment Rental and Leasing, n.e.c.	0.45	97.36
2951	Paving Mixtures and Blocks	0.38	97.74
1795	Wrecking and Demolition Work	0.31	98.06
5051	Metals Service Centers and Offices	0.24	98.30
7997	Membership Sports and Recreation Clubs	0.22	98.51
1711	Plumbing, Heating, and Air Conditioning	0.19	98.71
3441	Fabricated Structural Metal	0.19	98.89
1422	Crushed and Broken Limestone	0.18	99.07
1781	Water Well Drilling	0.13	99.20
8741	Management Services	0.11	99.31
3449	Miscellaneous Metal Work	0.08	99.39
7389	Business Services, n.e.c.	0.08	99.47
6552	Subdividers and Developers, n.e.c.	0.08	99.55
5063	Electrical Apparatus, Equipment, & Supplies	0.08	99.63
781	Landscape Counseling and Planning	0.07	99.70
8713	Surveying Services	0.06	99.76
1442	Construction Sand and Gravel	0.05	99.81
8711	Engineering Services	0.03	99.84
5039	Construction Materials, n.e.c.	0.02	99.87
1741	Masonry and Other Stonework	0.02	99.89
5033	Roofing, Siding, and Insulation Materials	0.02	99.91
7699	Repair Shops and Related Services, n.e.c.	0.02	99.92
3272	Concrete Products, n.e.c.	0.01	99.94
5983	Fuel Oil Dealers	0.01	99.95
8734	Testing Laboratories	0.01	99.96

SIC Code	SIC Description	Percentage	Cumulative Percentage
5082	Construction & Mining Machinery & Equipment	0.01	99.96
181	Ornamental Nursery Products	0.01	99.97
5171	Petroleum Bulk Stations and Terminals	0.01	99.97
3446	Architectural Metal Work	<0.01	99.98
5032	Brick, Stone, & Related Construction Materials	<0.01	99.98
3699	Electrical Equipment and Supplies, n.e.c.	<0.01	99.99
3271	Concrete Brick and Block	<0.01	99.99
5084	Industrial Machinery and Equipment	<0.01	99.99
1459	Clay and Related Minerals, n.e.c.	<0.01	99.99
5169	Chemicals and Allied Products, n.e.c.	<0.01	99.99
8712	Architectural Services	<0.01	100.00
4952	Sewerage Systems	<0.01	100.00
2411	Logging Contractors	<0.01	100.00
1742	Plastering, Dry Wall, and Insulation	<0.01	100.00
3444	Sheet Metal Work	<0.01	100.00
1761	Roofing, Siding, and Sheet Metal Work	<0.01	100.00
1522	Residential Construction, n.e.c.	<0.01	100.00
3599	Industrial Machinery, n.e.c.	<0.01	100.00
8748	Business Consulting, n.e.c.	<0.01	100.00
3471	Plating and Polishing	<0.01	100.00
783	Ornamental Shrub and Tree Services	<0.01	100.00
7371	Computer Programming Services	<0.01	100.00
2421	Sawmills and Planing Mills, General	<0.01	100.00
	TOTAL	$4,542,141,843	

A total of 19 SIC codes were identified in MoDOT's consultant contracting market. Table 1B shows that 95 percent of MoDOT consulting activities occurs in just four industries and that one industry, SIC 8711, accounts for almost 84 percent of consulting activity.

Table 1B. Product Market for MoDOT Consulting Contracts

SIC Code	SIC Description	Percentage	Cumulative Percentage
8711	Engineering Services	83.68	83.68
8734	Testing Laboratories	6.30	89.97
8712	Architectural Services	2.94	92.91
8741	Management Services	2.14	95.05
1741	Masonry and Other Stonework	1.00	96.05
8713	Surveying Services	0.89	96.95
3699	Electrical Equipment and Supplies, n.e.c.	0.55	97.50
8731	Commercial Physical and Biological Research	0.44	97.94
1629	Heavy Construction, n.e.c.	0.41	98.35
8743	Public Relations Services	0.37	98.72
8748	Business Consulting, n.e.c.	0.33	99.05
6531	Real Estate Agents and Managers	0.23	99.28
8742	Management Consulting Services	0.18	99.46
6552	Subdividers and Developers, n.e.c.	0.15	99.60
7335	Commercial Photography	0.15	99.75
7389	Business Services, n.e.c.	0.13	99.88
5063	Electrical Apparatus, Equipment, Wiring Supplies, and Construction Materials	0.08	99.97
1731	Electrical Work	0.02	99.99
1799	Special Trade Contractors, n.e.c.	0.01	100.00
	TOTAL	$145,380,628	

A total of 22 SIC codes were identified in MoDOT's off-systems contracting market. Table 1C shows that 90 percent of MoDOT off-systems activity occurs in just eight industries and that one industry, SIC 1611, accounts for 24 percent of off-systems activity.

Table 1C. Product Market for MoDOT Off-Systems Contracts

SIC Code	SIC Description	Percentage	Cumulative Percentage
1611	Highway and Street Construction	24.26	24.26
1622	Bridge, Tunnel, and Elevated Highway	22.1	46.35
1794	Excavation Work	14.69	61.04
1771	Concrete Work	11.43	72.48
1623	Water, Sewer, and Utility Lines	6.02	78.49
1542	Nonresidential Construction, n.e.c.	5.3	83.8
1629	Heavy Construction, n.e.c.	3.42	87.22
782	Lawn and Garden Services	3.27	90.49
1731	Electrical Work	3.12	93.61
3273	Ready-Mixed Concrete	1.44	95.05
1521	Single-Family Housing Construction	1.08	96.13
5051	Metals Service Centers and Offices	1.05	97.18
1791	Structural Steel Erection	0.86	98.05
4212	Local Trucking Without Storage	0.73	98.78
1541	Industrial Buildings and Warehouses	0.39	99.17
7359	Equipment Rental and Leasing, n.e.c.	0.3	99.47
8711	Engineering Services	0.22	99.69
3272	Concrete Products, n.e.c.	0.18	99.86
1721	Painting	0.06	99.92
5063	Electrical Apparatus and Equipment, Wiring Supplies, and Construction Materials	0.04	99.97
5172	Petroleum and Petroleum Products Wholesalers, Except Bulk Stations and Terminals	0.02	99.98
3446	Architectural Metal Work	0.02	100
	TOTAL	$48,540,859	

Finally, Table 1D presents the overall product market that NERA identified for MoDOT, including construction, consultant, and off-systems contracts. A total of 71 SIC codes are included in this market, although one SIC code, SIC 1611, accounts for 59 percent of all activity, and 90 percent of all activity is accounted for by just 10 SIC codes.

Table 1D. Product Market for all MoDOT Contracts

SIC Code	SIC Description	Percentage	Cumulative Percentage
1611	Highway and Street Construction	58.92	58.92
1622	Bridge, Tunnel, and Elevated Highway	13.11	72.02
1771	Concrete Work	4.33	76.35
1794	Excavation Work	2.74	79.09
8711	Engineering Services	2.60	81.69
1623	Water, Sewer, and Utility Lines	1.97	83.66
1791	Structural Steel Erection	1.77	85.43
1629	Heavy Construction, n.e.c.	1.64	87.08
1731	Electrical Work	1.46	88.54
1721	Painting	1.38	89.91
4212	Local Trucking Without Storage	1.10	91.01
782	Lawn and Garden Services	0.88	91.89
1542	Nonresidential Construction, n.e.c.	0.87	92.76
5172	Petroleum and Petroleum Products Wholesalers, Except Bulk Stations and Terminals	0.86	93.62
1411	Dimension Stone	0.66	94.29
3273	Ready-Mixed Concrete	0.62	94.91
1799	Special Trade Contractors, n.e.c.	0.61	95.52
1541	Industrial Buildings and Warehouses	0.60	96.12
1521	Single-Family Housing Construction	0.45	96.57
7359	Equipment Rental and Leasing, n.e.c.	0.43	97.00
2951	Paving Mixtures and Blocks	0.37	97.36
1795	Wrecking and Demolition Work	0.30	97.66
5051	Metals Service Centers and Offices	0.24	97.91
7997	Membership Sports and Recreation Clubs	0.21	98.11
8734	Testing Laboratories	0.20	98.32
1711	Plumbing, Heating, and Air Conditioning	0.19	98.50
3441	Fabricated Structural Metal	0.18	98.68
1422	Crushed and Broken Limestone	0.17	98.85
8741	Management Services	0.17	99.02
1781	Water Well Drilling	0.12	99.14
8712	Architectural Services	0.09	99.24

SIC Code	SIC Description	Percentage	Cumulative Percentage
8713	Surveying Services	0.08	99.32
7389	Business Services, n.e.c.	0.08	99.4
3449	Miscellaneous Metal Work	0.08	99.48
6552	Subdividers and Developers, n.e.c.	0.08	99.56
5063	Electrical Apparatus and Equipment, Wiring Supplies, and Construction Materials	0.08	99.64
781	Landscape Counseling and Planning	0.07	99.71
1741	Masonry and Other Stonework	0.05	99.76
1442	Construction Sand and Gravel	0.05	99.81
5039	Construction Materials, n.e.c.	0.02	99.83
3699	Electrical Equipment and Supplies, n.e.c.	0.02	99.85
5033	Roofing, Siding, and Insulation Materials	0.02	99.87
3272	Concrete Products, n.e.c.	0.01	99.88
7699	Repair Shops and Related Services, n.e.c.	0.01	99.90
8731	Commercial Physical and Biological Research	0.01	99.91
5983	Fuel Oil Dealers	0.01	99.92
8743	Public Relations Services	0.01	99.94
8748	Business Consulting, n.e.c.	0.01	99.95
6531	Real Estate Agents and Managers	0.01	99.95
5082	Construction and Mining (Except Petroleum) Machinery and Equipment	0.01	99.96
181	Ornamental Nursery Products	0.01	99.96
8742	Management Consulting Services	0.01	99.97
5171	Petroleum Bulk Stations and Terminals	<0.01	99.98
7335	Commercial Photography	<0.01	99.98
3446	Architectural Metal Work	<0.01	99.98
5032	Brick, Stone, and Related Construction Materials	<0.01	99.99
3271	Concrete Brick and Block	<0.01	99.99
5084	Industrial Machinery and Equipment	<0.01	99.99
1459	Clay and Related Minerals, n.e.c.	<0.01	100.0
5169	Chemicals and Allied Products, n.e.c.	<0.01	100.0
4952	Sewerage Systems	<0.01	100.0
2411	Logging Camps and Logging Contractors	<0.01	100.0
1742	Plastering, Dry Wall, and Insulation	<0.01	100.0

SIC Code	SIC Description	Percentage	Cumulative Percentage
3444	Sheet Metal Work	<0.01	100.0
1761	Roofing, Siding, and Sheet Metal Work	<0.01	100.0
1522	Residential Construction, n.e.c.	<0.01	100.0
3599	Industrial Machinery, n.e.c.	<0.01	100.0
3471	Plating and Polishing	<0.01	100.0
783	Ornamental Shrub and Tree Services	<0.01	100.0
7371	Computer Programming Services	<0.01	100.0
2421	Sawmills and Planing Mills, General	<0.01	100.0
	TOTAL	$4,736,063,329	

C. Geographic Market Definition

To determine the geographic dimension of MoDOT's contracting markets, we used the master contract and subcontract database, as described above in Section II.A, to obtain the zip codes and thereby the county and state for each contractor and subcontractor in the database. Using the location information, we calculated the percentage of MoDOT contract dollars awarded to businesses by state and county during the study period.

Table 2A. Distribution of MoDOT Contract Dollars by Contract Category

Location	Construction (%)	Consulting (%)	Off-Systems (%)
Inside Missouri	82.1	83.8	82.4
Outside Missouri	17.9	16.2	17.6
Inside Missouri, STL MSA, or KC MSA	86.7	89.2	99.6
Outside Missouri, STL MSA, or KC MSA	13.3	10.8	0.4

Source: NERA calculations from MoDOT master contract/subcontract database.

Contractors located in Missouri account for the vast majority of MoDOT's contracting expenditures. As shown in Table 2A, MoDOT awarded more than 82 percent of its construction

dollars during the study period to contractors with businesses located in Missouri.[16] For consulting contracts, MoDOT awarded about 84 percent of its dollars to businesses in Missouri.[17] For off-systems contracts, MoDOT awarded about 82 percent of its dollars to such businesses.

We also find significant levels of contracting within the portions of the Kansas City and St. Louis metropolitan areas located in Kansas and Illinois, respectively. When we include these geographic areas, we find that MoDOT does 87 percent, 89 percent, and 99 percent of its construction, consulting, and off-systems business with contractors located in this region. For convenience, we will refer this as the MO-KC-STL area.

When all three contract categories are aggregated, as in Table 2B, we see a similar geographic distribution. More than 82 percent of contract dollars flow to firms with locations in Missouri, and almost 87 percent to firms located in MO-KC-STL.

Table 2B. Overall Distribution of MoDOT Contract Dollars

Location	All Contracts (%)
Inside Missouri	82.1
Outside Missouri	17.9
Inside MO-KC-STL	86.9
Outside MO-KC-STL	13.1

Source: NERA calculations from MoDOT master contract/subcontract database.

Within MO-KC-STL, however, there is considerable county-to-county variation in MoDOT's contract spending. Table 2C shows, for example, that contractors located in Boone County (Jefferson City area), Jackson County (Kansas City Area), St. Louis County and St. Louis City account for relatively more contract dollars than businesses located elsewhere in the MO-KC-STL area. Based on the information in Tables 2A–2C, we define the MO-KC-STL area (allowing

[16] After Missouri, the most important states in terms of contract dollars were Illinois (5.1 percent), Kansas (4.6 percent), Iowa (3.0 percent), Wisconsin (1.8 percent), and Indiana (1.0 percent).

[17] After Missouri, the most important states in terms of contract dollars were Illinois (11.6 percent) and Kansas (3.3 percent).

for county-to–county variation within this area) to be the relevant market for purposes of estimating availability.[18]

Table 2C. County Distribution of MoDOT Contract Dollars (MO-KC-STL)

County	State	All Contracts (%)
ADAIR	MO	<0.01
ANDREW	MO	0.15
AUDRAIN	MO	0.06
BARRY	MO	0.03
BARTON	MO	0.03
BENTON	MO	0.02
BOONE	MO	11.14
BUCHANAN	MO	2.37
BUTLER	MO	1.50
CALLAWAY	MO	0.34
CAMDEN	MO	0.16
CAPE GIRARDEAU	MO	1.34
CARTER	MO	0.73
CASS	MO	0.94
CEDAR	MO	0.09
CHRISTIAN	MO	0.15
CLAY	MO	0.60
COLE	MO	2.33
COOPER	MO	0.02
DADE	MO	<0.01
FRANKLIN	MO	0.23

[18] No contractors or subcontractors were located in the Missouri counties of Atchison, Bates, Bollinger, Caldwell, Carroll, Chariton, Clark, Clinton, Crawford, Dallas, Daviess, DeKalb, Dent, Douglas, Dunklin, Gasconade, Grundy, Harrison, Hickory, Howard, Maries, Marion, Mcdonald, Mercer, Mississippi, Montgomery, Morgan, New Madrid, Ozark, Pemiscot, Polk, Putnam, Randolph, Reynolds, Saint Clair, Schuyler, Shannon, Sullivan, Texas, Wayne, or Worth. For the Illinois portion of the St. Louis MSA, no contractors or subcontractors were located in Bond, Calhoun, Clinton, Jersey, or Macoupin County. In the Kansas portion of the Kansas City MSA, no contractor or subcontractors were located in Doniphan County.

County	State	All Contracts (%)
GENTRY	MO	<0.01
GREENE	MO	4.22
HENRY	MO	0.92
HOLT	MO	<0.01
HOWELL	MO	1.00
IRON	MO	<0.01
JACKSON	MO	13.17
JASPER	MO	0.58
JEFFERSON	MO	3.79
JOHNSON	MO	0.03
KNOX	MO	0.05
LACLEDE	MO	0.10
LAFAYETTE	MO	0.45
LAWRENCE	MO	0.04
LEWIS	MO	<0.01
LINCOLN	MO	0.11
LINN	MO	0.01
LIVINGSTON	MO	0.09
MACON	MO	0.54
MARION	MO	6.17
MILLER	MO	<0.01
MONITEAU	MO	<0.01
MONROE	MO	0.02
NEWTON	MO	0.02
NODAWAY	MO	1.62
OREGON	MO	0.01
OSAGE	MO	0.03
PERRY	MO	0.01
PETTIS	MO	1.99
PHELPS	MO	0.01
PIKE	MO	0.16
PLATTE	MO	0.34
PULASKI	MO	0.02

County	State	All Contracts (%)
RALLS	MO	0.02
RAY	MO	0.02
RIPLEY	MO	0.01
SAINT CHARLES	MO	8.90
SAINT FRANCOIS	MO	0.18
SAINT LOUIS	MO	13.89
SAINT LOUIS CITY	MO	11.79
SAINTE GENEVIEVE	MO	0.47
SALINE	MO	0.19
SCOTLAND	MO	<0.01
SCOTT	MO	0.10
SHELBY	MO	0.92
STODDARD	MO	0.02
STONE	MO	<0.01
TANEY	MO	0.07
VERNON	MO	0.03
WARREN	MO	0.13
WASHINGTON	MO	0.01
WEBSTER	MO	0.04
WRIGHT	MO	<0.01
MADISON	IL	0.22
MONROE	IL	<0.01
SAINT CLAIR	IL	0.20
FRANKLIN	KS	<0.01
JOHNSON	KS	2.58
LEAVENWORTH	KS	0.52
LINN	KS	<0.01
MIAMI	KS	0.01
WYANDOTTE	KS	1.96
TOTAL		**100.0**

Source: NERA calculations from MoDOT contracts databases.

III. IDENTIFYING BUSINESSES IN THE RELEVANT MARKETS

DBE availability (unweighted) is defined as the number of DBEs divided by the total number of businesses in the counties and industries relevant to MoDOT's contracting activities.[19] Determining the total number of businesses in the relevant markets is more straightforward than determining the number of minority- or women-owned businesses in those markets. The latter task has three main parts: (1) identify all listed DBEs in the relevant market; (2) verify the ownership status of listed DBEs; and (3) estimate the number of unlisted DBEs in the relevant market. This section describes, in turn, how both tasks were accomplished.

A. Estimate the Total Number of Businesses in the Market

We used Dun & Bradstreet's *MarketPlace* database to determine the total number of businesses operating in the relevant geographic and product markets (these markets were discussed in the previous section). *MarketPlace* is a comprehensive database of U. S. businesses. This database, which contains over 13 million records, is updated continuously, and Dun & Bradstreet issues a revised version each quarter. For this study, we used data for the second quarter of 2004. Each record in *MarketPlace* represents a business and includes the company name, address, telephone number, primary four-digit SIC code, secondary SIC code(s) (if any), business type, DUNS Number (a unique number assigned to each business by Dun & Bradstreet) and other descriptive information. Dun & Bradstreet gathers and verifies information from many different sources. These sources include annual management interviews, payment experiences, bank account information, filings for suits, liens, judgments and bankruptcies, news items, the U. S. Postal Service, utility and telephone service, business registrations, corporate charters, Uniform Commercial Code filings, and records of the Small Business Administration and other governmental agencies.

We used the *MarketPlace* database to identify the total number of businesses in each four-digit SIC code to which we had assigned a product market weight.[20] Table 3A shows the number of businesses identified in each SIC code, along with the associated industry weight (all contracting combined). Comparable data for construction, consulting, and off-systems appear in Tables 3B–3D,

[19] To yield a percentage, the resulting figure is multiplied by 100.

[20] These weights are described above in Section II.B.

respectively.

Table 3A. Number of Businesses and Industry Weight, by SIC Code

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
1611	Highway and Street Construction	457	58.93	58.93
1622	Bridge, Tunnel, and Elevated Highway	39	13.11	72.04
1771	Concrete Work	1169	4.34	76.37
1794	Excavation Work	1284	2.74	79.11
8711	Engineering Services	1347	2.60	81.71
1623	Water, Sewer, and Utility Lines	390	1.97	83.68
1791	Structural Steel Erection	107	1.77	85.45
1629	Heavy Construction, n.e.c.	391	1.64	87.10
1731	Electrical Work	1834	1.46	88.56
1721	Painting	1603	1.38	89.94
4212	Local Trucking Without Storage	2518	1.10	91.03
782	Lawn and Garden Services	2097	0.88	91.92
1542	Nonresidential Construction, n.e.c.	1374	0.87	92.79
5172	Petroleum Products Wholesalers	384	0.86	93.65
1411	Dimension Stone	28	0.66	94.31
3273	Ready-Mixed Concrete	279	0.62	94.94
1799	Special Trade Contractors, n.e.c.	2685	0.61	95.55
1541	Industrial Buildings and Warehouses	210	0.60	96.14
1521	Single-Family Housing Construction	6278	0.45	96.59
7359	Equipment Rental and Leasing, n.e.c.	1226	0.43	97.02
2951	Paving Mixtures and Blocks	56	0.37	97.39
1795	Wrecking and Demolition Work	82	0.30	97.69
5051	Metals Service Centers and Offices	418	0.24	97.93
7997	Membership Sports and Recreation Clubs	25	0.21	98.14
8734	Testing Laboratories	173	0.20	98.34
1711	Plumbing, Heating, and Air Conditioning	3730	0.19	98.53
3441	Fabricated Structural Metal	254	0.18	98.71
1422	Crushed and Broken Limestone	103	0.17	98.88
8741	Management Services	95	0.17	99.05

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
1781	Water Well Drilling	154	0.12	99.17
8712	Architectural Services	699	0.09	99.26
8713	Surveying Services	221	0.08	99.34
7389	Business Services, n.e.c.	10	0.08	99.43
3449	Miscellaneous Metal Work	16	0.08	99.51
6552	Subdividers and Developers, n.e.c.	651	0.08	99.59
5063	Electrical Apparatus and Equipment,	749	0.08	99.66
781	Landscape Counseling and Planning	529	0.07	99.73
1741	Masonry and Other Stonework	703	0.05	99.79
1442	Construction Sand and Gravel	38	0.05	99.83
5039	Construction Materials, n.e.c.	159	0.02	99.86
3699	Electrical Equipment and Supplies, n.e.c.	81	0.02	99.88
5033	Roofing, Siding, and Insulation Materials	145	0.02	99.90
3272	Concrete Products, n.e.c.	151	0.01	99.91
7699	Repair Shops and Related Services, n.e.c.	604	0.01	99.92
5983	Fuel Oil Dealers	47	0.01	99.94
8743	Public Relations Services	168	0.01	99.95
8748	Business Consulting, n.e.c.	109	0.01	99.96
5082	Construction and Mining Equipment	255	0.01	99.96
181	Ornamental Nursery Products	292	0.01	99.97
5171	Petroleum Bulk Stations and Terminals	285	<0.01	99.98
7335	Commercial Photography	385	<0.01	99.98
3446	Architectural Metal Work	101	<0.01	99.98
5032	Brick, Stone, and Related Construction Materials	292	<0.01	99.99
3271	Concrete Brick and Block	31	<0.01	99.99
5084	Industrial Machinery and Equipment	1531	<0.01	99.99
1459	Clay and Related Minerals, n.e.c.	6	<0.01	100.00
5169	Chemicals and Allied Products, n.e.c.	475	<0.01	100.00
4952	Sewerage Systems	55	<0.01	100.00
2411	Logging Camps and Logging Contractors	91	<0.01	100.00
1742	Plastering, Dry Wall, and Insulation	689	<0.01	100.00
3444	Sheet Metal Work	205	<0.01	100.00

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
1761	Roofing, Siding, and Sheet Metal Work	1618	<0.01	100.00
1522	Residential Construction, n.e.c.	806	<0.01	100.00
3599	Industrial Machinery, n.e.c.	728	<0.01	100.00
3471	Plating and Polishing	110	<0.01	100.00
783	Ornamental Shrub and Tree Services	422	<0.01	100.00
7371	Computer Programming Services	1066	<0.01	100.00
2421	Sawmills and Planing Mills, General	242	<0.01	100.00
	TOTAL	45,555		

Table 3B. Construction—Number of Businesses and Industry Weight, by SIC Code

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
1611	Highway and Street Construction	457	61.17	61.17
1622	Bridge, Tunnel, and Elevated Highway	39	13.43	74.60
1771	Concrete Work	1169	4.40	79.00
1794	Excavation Work	1284	2.70	81.69
1623	Water, Sewer, and Utility Lines	390	1.99	83.68
1791	Structural Steel Erection	107	1.84	85.52
1629	Heavy Construction, n.e.c.	391	1.66	87.19
1731	Electrical Work	1834	1.49	88.68
1721	Painting	1603	1.43	90.11
4212	Local Trucking Without Storage	2518	1.14	91.24
5172	Petroleum Products Wholesalers	384	0.90	92.14
782	Lawn and Garden Services	2097	0.88	93.03
1542	Nonresidential Construction, n.e.c.	1374	0.85	93.88
1411	Dimension Stone	28	0.69	94.57

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
3273	Ready-Mixed Concrete	279	0.64	95.20
1799	Special Trade Contractors, n.e.c.	2685	0.64	95.84
1541	Industrial Buildings and Warehouses	210	0.62	96.46
1521	Single-Family Housing Construction	6278	0.45	96.91
7359	Equipment Rental and Leasing, n.e.c.	1226	0.45	97.36
2951	Paving Mixtures and Blocks	56	0.38	97.74
1795	Wrecking and Demolition Work	82	0.31	98.06
5051	Metals Service Centers and Offices	418	0.24	98.30
7997	Membership Sports and Recreation Clubs	25	0.22	98.51
1711	Plumbing, Heating, and Air Conditioning	3730	0.19	98.71
3441	Fabricated Structural Metal	254	0.19	98.89
1422	Crushed and Broken Limestone	103	0.18	99.07
1781	Water Well Drilling	154	0.13	99.20
8741	Management Services	95	0.11	99.31
3449	Miscellaneous Metal Work	16	0.08	99.39
7389	Business Services, n.e.c.	10	0.08	99.47
6552	Subdividers and Developers, n.e.c.	651	0.08	99.55
5063	Electrical Apparatus and Equipment	749	0.08	99.63
781	Landscape Counseling and Planning	529	0.07	99.70
8713	Surveying Services	221	0.06	99.76
1442	Construction Sand and Gravel	38	0.05	99.81
8711	Engineering Services	1347	0.03	99.84
5039	Construction Materials, n.e.c.	159	0.02	99.87
1741	Masonry and Other Stonework	703	0.02	99.89
5033	Roofing, Siding, and Insulation Materials	145	0.02	99.91
7699	Repair Shops and Related Services, n.e.c.	604	0.02	99.92
3272	Concrete Products, n.e.c.	151	0.01	99.94
5983	Fuel Oil Dealers	47	0.01	99.95
8734	Testing Laboratories	173	0.01	99.96
5082	Construction and Mining Equipment	255	0.01	99.96
181	Ornamental Nursery Products	292	0.01	99.97
5171	Petroleum Bulk Stations and Terminals	285	0.01	99.97

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
3446	Architectural Metal Work	101	<0.01	99.98
5032	Brick, Stone, and Related Construction Materials	292	<0.01	99.98
3699	Electrical Equipment and Supplies, n.e.c.	81	<0.01	99.99
3271	Concrete Brick and Block	31	<0.01	99.99
5084	Industrial Machinery and Equipment	1531	<0.01	99.99
1459	Clay and Related Minerals, n.e.c.	6	<0.01	99.99
5169	Chemicals and Allied Products, n.e.c.	475	<0.01	99.99
8712	Architectural Services	699	<0.01	100.00
4952	Sewerage Systems	55	<0.01	100.00
2411	Logging Camps and Logging Contractors	91	<0.01	100.00
1742	Plastering, Dry Wall, and Insulation	689	<0.01	100.00
3444	Sheet Metal Work	205	<0.01	100.00
1761	Roofing, Siding, and Sheet Metal Work	1618	<0.01	100.00
1522	Residential Construction, n.e.c.	806	<0.01	100.00
3599	Industrial Machinery, n.e.c.	728	<0.01	100.00
8748	Business Consulting, n.e.c.	109	<0.01	100.00
3471	Plating and Polishing	110	<0.01	100.00
783	Ornamental Shrub and Tree Services	422	<0.01	100.00
7371	Computer Programming Services	1066	<0.01	100.00
2421	Sawmills and Planing Mills, General	242	<0.01	100.00
	TOTAL	45,002		

Table 3C. Consulting—Number of Businesses and Industry Weight, by SIC Code

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
8711	Engineering Services	1347	84.39	84.39
8734	Testing Laboratories	173	6.35	90.74
8712	Architectural Services	699	2.96	93.70
8741	Management Services	95	2.16	95.86
1741	Masonry and Other Stonework	703	1.01	96.87
8713	Surveying Services	221	0.90	97.77
3699	Electrical Equipment and Supplies, n.e.c.	81	0.56	98.33
1629	Heavy Construction, n.e.c.	391	0.42	98.75
8743	Public Relations Services	168	0.37	99.12
8748	Business Consulting, n.e.c.	109	0.33	99.45
6552	Subdividers and Developers, n.e.c.	651	0.15	99.60
7335	Commercial Photography	385	0.15	99.75
7389	Business Services, n.e.c.	10	0.14	99.88
5063	Electrical Apparatus and Equipment, Wiring Supplies, and Construction Materials	749	0.08	99.97
1731	Electrical Work	1834	0.02	99.99
1799	Special Trade Contractors, n.e.c.	2685	0.01	100.00
	TOTAL	10,301		

Table 3D. Off-Systems—Number of Businesses and Industry Weight, by SIC Code

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
1611	Highway and Street Construction	457	24.26	24.26
1622	Bridge, Tunnel, and Elevated Highway	39	22.10	46.35
1794	Excavation Work	1284	14.69	61.04
1771	Concrete Work	1169	11.43	72.48
1623	Water, Sewer, and Utility Lines	390	6.02	78.49
1542	Nonresidential Construction, n.e.c.	1374	5.30	83.80
1629	Heavy Construction, n.e.c.	391	3.42	87.22
782	Lawn and Garden Services	2097	3.27	90.49
1731	Electrical Work	1834	3.12	93.61
3273	Ready-Mixed Concrete	279	1.44	95.05
1521	Single-Family Housing Construction	6278	1.08	96.13
5051	Metals Service Centers and Offices	418	1.05	97.18
1791	Structural Steel Erection	107	0.86	98.05
4212	Local Trucking Without Storage	2518	0.73	98.78
1541	Industrial Buildings and Warehouses	210	0.39	99.17
7359	Equipment Rental and Leasing, n.e.c.	1226	0.30	99.47
8711	Engineering Services	1347	0.22	99.69
3272	Concrete Products, n.e.c.	151	0.18	99.86
1721	Painting	1603	0.06	99.92
5063	Electrical Apparatus and Equipment,	749	0.04	99.97
5172	Petroleum Products Wholesalers	384	0.02	99.98
3446	Architectural Metal Work	101	0.02	100.00
	TOTAL	24,406		

Although numerous industries play a role in MoDOT's contracting activities, it is clear that contracting opportunities are not distributed evenly among them. The distribution of contract expenditures is, in fact, highly skewed. Overall (Table 3A), we see that one industry accounts for almost 60 percent of expenditures, the top four industries account for 80 percent, and the top ten industries account for 90 percent. The remaining 10 percent of expenditures is widely distributed across 58 additional industries. In construction, a single industry accounts for over 60 percent of all contracting expenditures, and the top four industries account for almost 80 percent (Table 3B). Concentration of this sort is even more prevalent in consulting (Table 3C), where a single industry accounts for almost 85 percent of all contracting expenditures. In off-systems (Table 3D) as well, almost 80 percent of contract expenditures are accounted for by just five industries.

B. Identify Listed DBEs

As extensive as it is, *MarketPlace* itself does not adequately identify all businesses owned by minorities or women. Although many such businesses *are* correctly identified in *MarketPlace*, experience has demonstrated that many more are missed. For this reason, several additional steps were required to identify the appropriate percentage of DBEs in the relevant market.

First, NERA completed an intensive regional search for information on minority-owned and woman-owned businesses in MO-KC-STL. Beyond the information already in *MarketPlace*, NERA collected lists of DBEs from MoDOT as well as other public and private entities in and surrounding Missouri. Specifically, directories were included from: State of Missouri Procurement Office and Office of Equal Opportunity; Illinois Department of Transportation; Kansas Department of Transportation; City of St. Louis/Lambert International Airport; St. Louis Minority Business Council; St. Louis METRO; Small Business Administration, St. Louis; St. Louis Black Pages; Kansas City, MO Black Pages; US Department of Commerce Minority Business Development Agency; St. Louis Que Pasa Hispanic Business Directory; US Pan Asian Chamber of Commerce; National Association of Women in Construction (St. Louis, Central Missouri, and Kansas City chapters); National Association of Women Business Owners (St. Louis and Kansas City chapters); St. Louis Women's Yellow Pages; Washington University (St. Louis); St. Louis/Missouri Hispanic Chamber of Commerce; City of Kansas City, MO; Kansas City Area Transportation Authority; Columbia Minority Contracting Alliance; Hispanic Chamber of Commerce of Greater Kansas City; Hispanic Contractors Association of Kansas City; American Subcontractors Association; Central Missouri State University; City of East St. Louis; St. Louis County Office of Community

Development; Madison County, IL Office of Community Development; St. Clair County, IL. Also included were the *Diversity Information Resources* directory of MBEs (formerly Try Us, Inc.); the National Directory of Minority and Women Owned Businesses, published by Business Research Services, Inc. of Washington, D.C.; and the federal government's Central Contractor Registration database.[21]

We will refer to the DBE businesses identified in this manner as "listed" DBEs. Tables 4A–4D provide the total number of listed DBEs by SIC code—overall, and for construction, consulting, and off-systems, respectively.[22]

Table 4A. Overall—Number of Listed DBEs and Industry Weight, by SIC Code

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
1611	Highway and Street Construction	55	58.93	58.93
1622	Bridge, Tunnel, and Elevated Highway	2	13.11	72.04
1771	Concrete Work	84	4.34	76.37
1794	Excavation Work	93	2.74	79.11
8711	Engineering Services	122	2.60	81.71
1623	Water, Sewer, and Utility Lines	36	1.97	83.68
1791	Structural Steel Erection	18	1.77	85.45
1629	Heavy Construction, n.e.c.	27	1.64	87.10
1731	Electrical Work	169	1.46	88.56
1721	Painting	142	1.38	89.94
4212	Local Trucking Without Storage	210	1.10	91.03
782	Lawn and Garden Services	142	0.88	91.92

[21] We obtained information from certain entities that was duplicative of either Dun & Bradstreet or one of the other sources already listed above. These entities were the St. Louis Minority Contractors Association; St. Louis Business Diversity Initiative; Missouri Lottery MWBE Program; Major League Baseball/St. Louis Cardinals Diverse Business Partners Program; and the U.S. Department of Navy Small and Disadvantaged Business Utilization Office.

[22] The industry weights appearing in Tables 4A-4D are identical to those in Tables 3A-3D, respectively.

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
1542	Nonresidential Construction, n.e.c.	115	0.87	92.79
5172	Petroleum Products Wholesalers	15	0.86	93.65
1411	Dimension Stone	1	0.66	94.31
3273	Ready-Mixed Concrete	17	0.62	94.94
1799	Special Trade Contractors, n.e.c.	182	0.61	95.55
1541	Industrial Buildings and Warehouses	19	0.60	96.14
1521	Single-Family Housing Construction	293	0.45	96.59
7359	Equipment Rental and Leasing, n.e.c.	98	0.43	97.02
2951	Paving Mixtures and Blocks	2	0.37	97.39
1795	Wrecking and Demolition Work	24	0.30	97.69
5051	Metals Service Centers and Offices	30	0.24	97.93
7997	Membership Sports and Recreation Clubs	1	0.21	98.14
8734	Testing Laboratories	25	0.20	98.34
1711	Plumbing, Heating, and Air Conditioning	224	0.19	98.53
3441	Fabricated Structural Metal	19	0.18	98.71
1422	Crushed and Broken Limestone	6	0.17	98.88
8741	Management Services	13	0.17	99.05
1781	Water Well Drilling	6	0.12	99.17
8712	Architectural Services	67	0.09	99.26
8713	Surveying Services	17	0.08	99.34
7389	Business Services, n.e.c.	1	0.08	99.43
3449	Miscellaneous Metal Work	1	0.08	99.51
6552	Subdividers and Developers, n.e.c.	29	0.08	99.59
5063	Electrical Apparatus and Equipment,	32	0.08	99.66
781	Landscape Counseling and Planning	57	0.07	99.73
1741	Masonry and Other Stonework	51	0.05	99.79
1442	Construction Sand and Gravel	4	0.05	99.83
5039	Construction Materials, n.e.c.	10	0.02	99.86
3699	Electrical Equipment and Supplies, n.e.c.	5	0.02	99.88
5033	Roofing, Siding, and Insulation Materials	7	0.02	99.90
3272	Concrete Products, n.e.c.	13	0.01	99.91
7699	Repair Shops and Related Services, n.e.c.	35	0.01	99.92

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
5983	Fuel Oil Dealers	2	0.01	99.94
8743	Public Relations Services	56	0.01	99.95
8748	Business Consulting, n.e.c.	13	0.01	99.96
5082	Construction and Mining Equipment	11	0.01	99.96
181	Ornamental Nursery Products	51	0.01	99.97
5171	Petroleum Bulk Stations and Terminals	12	<0.01	99.98
7335	Commercial Photography	47	<0.01	99.98
3446	Architectural Metal Work	5	<0.01	99.98
5032	Brick, Stone, and Related Construction Materials	23	<0.01	99.99
3271	Concrete Brick and Block	1	<0.01	99.99
5084	Industrial Machinery and Equipment	96	<0.01	99.99
1459	Clay and Related Minerals, n.e.c.	1	<0.01	100.00
5169	Chemicals and Allied Products, n.e.c.	33	<0.01	100.00
4952	Sewerage Systems	1	<0.01	100.00
2411	Logging Camps and Logging Contractors	2	<0.01	100.00
1742	Plastering, Dry Wall, and Insulation	47	<0.01	100.00
3444	Sheet Metal Work	21	<0.01	100.00
1761	Roofing, Siding, and Sheet Metal Work	93	<0.01	100.00
1522	Residential Construction, n.e.c.	54	<0.01	100.00
3599	Industrial Machinery, n.e.c.	50	<0.01	100.00
3471	Plating and Polishing	5	<0.01	100.00
783	Ornamental Shrub and Tree Services	19	<0.01	100.00
7371	Computer Programming Services	125	<0.01	100.00
2421	Sawmills and Planing Mills, General	6	<0.01	100.00
	TOTAL	3,293		

Table 4B. Construction—Number of Listed DBEs and Industry Weight, by SIC Code

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
1611	Highway and Street Construction	55	61.17	61.17
1622	Bridge, Tunnel, and Elevated Highway	2	13.43	74.60
1771	Concrete Work	84	4.40	79.00
1794	Excavation Work	93	2.70	81.69
1623	Water, Sewer, and Utility Lines	36	1.99	83.68
1791	Structural Steel Erection	18	1.84	85.52
1629	Heavy Construction, n.e.c.	27	1.66	87.19
1731	Electrical Work	169	1.49	88.68
1721	Painting	142	1.43	90.11
4212	Local Trucking Without Storage	210	1.14	91.24
5172	Petroleum Products Wholesalers	15	0.90	92.14
782	Lawn and Garden Services	142	0.88	93.03
1542	Nonresidential Construction, n.e.c.	115	0.85	93.88
1411	Dimension Stone	1	0.69	94.57
3273	Ready-Mixed Concrete	17	0.64	95.20
1799	Special Trade Contractors, n.e.c.	182	0.64	95.84
1541	Industrial Buildings and Warehouses	19	0.62	96.46
1521	Single-Family Housing Construction	293	0.45	96.91
7359	Equipment Rental and Leasing, n.e.c.	98	0.45	97.36
2951	Paving Mixtures and Blocks	2	0.38	97.74
1795	Wrecking and Demolition Work	24	0.31	98.06
5051	Metals Service Centers and Offices	30	0.24	98.30
7997	Membership Sports and Recreation Clubs	1	0.22	98.51
1711	Plumbing, Heating, and Air Conditioning	224	0.19	98.71
3441	Fabricated Structural Metal	19	0.19	98.89
1422	Crushed and Broken Limestone	6	0.18	99.07
1781	Water Well Drilling	6	0.13	99.20
8741	Management Services	13	0.11	99.31
3449	Miscellaneous Metal Work	1	0.08	99.39
7389	Business Services, n.e.c.	1	0.08	99.47

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
6552	Subdividers and Developers, n.e.c.	29	0.08	99.55
5063	Electrical Apparatus and Equipment	32	0.08	99.63
781	Landscape Counseling and Planning	57	0.07	99.70
8713	Surveying Services	17	0.06	99.76
1442	Construction Sand and Gravel	4	0.05	99.81
8711	Engineering Services	122	0.03	99.84
5039	Construction Materials, n.e.c.	10	0.02	99.87
1741	Masonry and Other Stonework	51	0.02	99.89
5033	Roofing, Siding, and Insulation Materials	7	0.02	99.91
7699	Repair Shops and Related Services, n.e.c.	35	0.02	99.92
3272	Concrete Products, n.e.c.	13	0.01	99.94
5983	Fuel Oil Dealers	2	0.01	99.95
8734	Testing Laboratories	25	0.01	99.96
5082	Construction and Mining Equipment	11	0.01	99.96
181	Ornamental Nursery Products	51	0.01	99.97
5171	Petroleum Bulk Stations and Terminals	12	0.01	99.97
3446	Architectural Metal Work	5	<0.01	99.98
5032	Brick, Stone, and Related Construction Materials	23	<0.01	99.98
3699	Electrical Equipment and Supplies, n.e.c.	5	<0.01	99.99
3271	Concrete Brick and Block	1	<0.01	99.99
5084	Industrial Machinery and Equipment	96	<0.01	99.99
1459	Clay and Related Minerals, n.e.c.	1	<0.01	99.99
5169	Chemicals and Allied Products, n.e.c.	33	<0.01	99.99
8712	Architectural Services	67	<0.01	100.00
4952	Sewerage Systems	1	<0.01	100.00
2411	Logging Camps and Logging Contractors	2	<0.01	100.00
1742	Plastering, Dry Wall, and Insulation	47	<0.01	100.00
3444	Sheet Metal Work	21	<0.01	100.00
1761	Roofing, Siding, and Sheet Metal Work	93	<0.01	100.00
1522	Residential Construction, n.e.c.	54	<0.01	100.00
3599	Industrial Machinery, n.e.c.	50	<0.01	100.00
8748	Business Consulting, n.e.c.	13	<0.01	100.00

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
3471	Plating and Polishing	5	<0.01	100.00
783	Ornamental Shrub and Tree Services	19	<0.01	100.00
7371	Computer Programming Services	125	<0.01	100.00
2421	Sawmills and Planing Mills, General	6	<0.01	100.00
	TOTAL	3,190		

Table 4C. Consulting—Number of Listed DBEs and Industry Weight, by SIC Code

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
8711	Engineering Services	122	84.39	84.39
8734	Testing Laboratories	25	6.35	90.74
8712	Architectural Services	67	2.96	93.70
8741	Management Services	13	2.16	95.86
1741	Masonry and Other Stonework	51	1.01	96.87
8713	Surveying Services	17	0.90	97.77
3699	Electrical Equipment and Supplies, n.e.c.	5	0.56	98.33
1629	Heavy Construction, n.e.c.	27	0.42	98.75
8743	Public Relations Services	56	0.37	99.12
8748	Business Consulting, n.e.c.	13	0.33	99.45
6552	Subdividers and Developers, n.e.c.	29	0.15	99.60
7335	Commercial Photography	47	0.15	99.75
7389	Business Services, n.e.c.	1	0.14	99.88
5063	Electrical Apparatus and Equipment, Wiring Supplies, and Construction Materials	32	0.08	99.97
1731	Electrical Work	169	0.02	99.99
1799	Special Trade Contractors, n.e.c.	182	0.01	100.00
	TOTAL	856		

Table 4D. Off-Systems—Number of Listed DBEs and Industry Weight, by SIC Code

SIC Code	SIC Description	Number of Establishments	Industry Weight	Industry Weight (Cumulative)
1611	Highway and Street Construction	55	24.26	24.26
1622	Bridge, Tunnel, and Elevated Highway	2	22.10	46.35
1794	Excavation Work	93	14.69	61.04
1771	Concrete Work	84	11.43	72.48
1623	Water, Sewer, and Utility Lines	36	6.02	78.49
1542	Nonresidential Construction, n.e.c.	115	5.30	83.80
1629	Heavy Construction, n.e.c.	27	3.42	87.22
782	Lawn and Garden Services	142	3.27	90.49
1731	Electrical Work	169	3.12	93.61
3273	Ready-Mixed Concrete	17	1.44	95.05
1521	Single-Family Housing Construction	293	1.08	96.13
5051	Metals Service Centers and Offices	30	1.05	97.18
1791	Structural Steel Erection	18	0.86	98.05
4212	Local Trucking Without Storage	210	0.73	98.78
1541	Industrial Buildings and Warehouses	19	0.39	99.17
7359	Equipment Rental and Leasing, n.e.c.	98	0.30	99.47
8711	Engineering Services	122	0.22	99.69
3272	Concrete Products, n.e.c.	13	0.18	99.86
1721	Painting	142	0.06	99.92
5063	Electrical Apparatus and Equipment,	32	0.04	99.97
5172	Petroleum Products Wholesalers	15	0.02	99.98
3446	Architectural Metal Work	5	0.02	100.00
	TOTAL	1,737		

If the listed DBEs identified in the four previous tables are *all* indeed DBEs and are the *only* DBEs among all the businesses identified in Tables 3A–3D, then an estimate of "listed" DBE availability would be calculated as shown in Tables 5A–5D. The availability figure in these tables is simply the number of listed DBEs (taken from Tables 4A–4D, respectively) divided by the total

number of businesses in the relevant market (taken from Tables 3A–3D, respectively).[23] However, as we shall see below neither of the two conditions is true.

Table 5A. Overall—Listed DBE Percentage and Industry Weight, by SIC Code

SIC Code	SIC Description	Per-centage Listed DBE	Industry Weight	Industry Weight (Cumu-lative)
1611	Highway and Street Construction	12.04	58.93	58.93
1622	Bridge, Tunnel, and Elevated Highway	5.13	13.11	72.04
1771	Concrete Work	7.19	4.34	76.37
1794	Excavation Work	7.24	2.74	79.11
8711	Engineering Services	9.06	2.60	81.71
1623	Water, Sewer, and Utility Lines	9.23	1.97	83.68
1791	Structural Steel Erection	16.82	1.77	85.45
1629	Heavy Construction, n.e.c.	6.91	1.64	87.10
1731	Electrical Work	9.21	1.46	88.56
1721	Painting	8.86	1.38	89.94
4212	Local Trucking Without Storage	8.34	1.10	91.03
782	Lawn and Garden Services	6.77	0.88	91.92
1542	Nonresidential Construction, n.e.c.	8.37	0.87	92.79
5172	Petroleum Products Wholesalers	3.91	0.86	93.65
1411	Dimension Stone	3.57	0.66	94.31
3273	Ready-Mixed Concrete	6.09	0.62	94.94
1799	Special Trade Contractors, n.e.c.	6.78	0.61	95.55
1541	Industrial Buildings and Warehouses	9.05	0.60	96.14
1521	Single-Family Housing Construction	4.67	0.45	96.59
7359	Equipment Rental and Leasing, n.e.c.	7.99	0.43	97.02
2951	Paving Mixtures and Blocks	3.57	0.37	97.39

[23] The industry weights appearing in Tables 3A–3D are identical to those in Tables 4A–4D. The "average availability" figure appearing at the bottom of each table is unweighted. That is, neither product market weights nor geographic weights have been applied. These weights are applied below.

SIC Code	SIC Description	Per-centage Listed DBE	Industry Weight	Industry Weight (Cumu-lative)
1795	Wrecking and Demolition Work	29.27	0.30	97.69
5051	Metals Service Centers and Offices	7.18	0.24	97.93
7997	Membership Sports and Recreation Clubs	4.00	0.21	98.14
8734	Testing Laboratories	14.45	0.20	98.34
1711	Plumbing, Heating, and Air Conditioning	6.01	0.19	98.53
3441	Fabricated Structural Metal	7.48	0.18	98.71
1422	Crushed and Broken Limestone	5.83	0.17	98.88
8741	Management Services	13.68	0.17	99.05
1781	Water Well Drilling	3.90	0.12	99.17
8712	Architectural Services	9.59	0.09	99.26
8713	Surveying Services	7.69	0.08	99.34
7389	Business Services, n.e.c.	10.00	0.08	99.43
3449	Miscellaneous Metal Work	6.25	0.08	99.51
6552	Subdividers and Developers, n.e.c.	4.45	0.08	99.59
5063	Electrical Apparatus and Equipment,	4.27	0.08	99.66
781	Landscape Counseling and Planning	10.78	0.07	99.73
1741	Masonry and Other Stonework	7.25	0.05	99.79
1442	Construction Sand and Gravel	10.53	0.05	99.83
5039	Construction Materials, n.e.c.	6.29	0.02	99.86
3699	Electrical Equipment and Supplies, n.e.c.	6.17	0.02	99.88
5033	Roofing, Siding, and Insulation Materials	4.83	0.02	99.90
3272	Concrete Products, n.e.c.	8.61	0.01	99.91
7699	Repair Shops and Related Services, n.e.c.	5.79	0.01	99.92
5983	Fuel Oil Dealers	4.26	0.01	99.94
8743	Public Relations Services	33.33	0.01	99.95
8748	Business Consulting, n.e.c.	11.93	0.01	99.96
5082	Construction and Mining Equipment	4.31	0.01	99.96
181	Ornamental Nursery Products	17.47	0.01	99.97
5171	Petroleum Bulk Stations and Terminals	4.21	<0.01	99.98
7335	Commercial Photography	12.21	<0.01	99.98
3446	Architectural Metal Work	4.95	<0.01	99.98
5032	Brick, Stone, and Related Construction Materials	7.88	<0.01	99.99
3271	Concrete Brick and Block	3.23	<0.01	99.99

SIC Code	SIC Description	Per-centage Listed DBE	Industry Weight	Industry Weight (Cumu-lative)
5084	Industrial Machinery and Equipment	6.27	<0.01	99.99
1459	Clay and Related Minerals, n.e.c.	16.67	<0.01	100.00
5169	Chemicals and Allied Products, n.e.c.	6.95	<0.01	100.00
4952	Sewerage Systems	1.82	<0.01	100.00
2411	Logging Camps and Logging Contractors	2.20	<0.01	100.00
1742	Plastering, Dry Wall, and Insulation	6.82	<0.01	100.00
3444	Sheet Metal Work	10.24	<0.01	100.00
1761	Roofing, Siding, and Sheet Metal Work	5.75	<0.01	100.00
1522	Residential Construction, n.e.c.	6.70	<0.01	100.00
3599	Industrial Machinery, n.e.c.	6.87	<0.01	100.00
3471	Plating and Polishing	4.55	<0.01	100.00
783	Ornamental Shrub and Tree Services	4.50	<0.01	100.00
7371	Computer Programming Services	11.73	<0.01	100.00
2421	Sawmills and Planing Mills, General	2.48	<0.01	100.00
	TOTAL (Unweighted)	7.23		

Table 5B. Construction—Listed DBE Percentage and Industry Weight, by SIC Code

SIC Code	SIC Description	Per-centage Listed DBE	Industry Weight	Industry Weight (Cumu-lative)
1611	Highway and Street Construction	12.04	61.17	61.17
1622	Bridge, Tunnel, and Elevated Highway	5.13	13.43	74.60
1771	Concrete Work	7.19	4.40	79.00
1794	Excavation Work	7.24	2.70	81.69
1623	Water, Sewer, and Utility Lines	9.23	1.99	83.68
1791	Structural Steel Erection	16.82	1.84	85.52
1629	Heavy Construction, n.e.c.	6.91	1.66	87.19
1731	Electrical Work	9.21	1.49	88.68
1721	Painting	8.86	1.43	90.11
4212	Local Trucking Without Storage	8.34	1.14	91.24
5172	Petroleum Products Wholesalers	3.91	0.90	92.14
782	Lawn and Garden Services	6.77	0.88	93.03
1542	Nonresidential Construction, n.e.c.	8.37	0.85	93.88
1411	Dimension Stone	3.57	0.69	94.57
3273	Ready-Mixed Concrete	6.09	0.64	95.20
1799	Special Trade Contractors, n.e.c.	6.78	0.64	95.84
1541	Industrial Buildings and Warehouses	9.05	0.62	96.46
1521	Single-Family Housing Construction	4.67	0.45	96.91
7359	Equipment Rental and Leasing, n.e.c.	7.99	0.45	97.36
2951	Paving Mixtures and Blocks	3.57	0.38	97.74
1795	Wrecking and Demolition Work	29.27	0.31	98.06
5051	Metals Service Centers and Offices	7.18	0.24	98.30
7997	Membership Sports and Recreation Clubs	4.00	0.22	98.51
1711	Plumbing, Heating, and Air Conditioning	6.01	0.19	98.71
3441	Fabricated Structural Metal	7.48	0.19	98.89
1422	Crushed and Broken Limestone	5.83	0.18	99.07
1781	Water Well Drilling	3.90	0.13	99.20
8741	Management Services	13.68	0.11	99.31
3449	Miscellaneous Metal Work	6.25	0.08	99.39

SIC Code	SIC Description	Per-centage Listed DBE	Industry Weight	Industry Weight (Cumu-lative)
7389	Business Services, n.e.c.	10.00	0.08	99.47
6552	Subdividers and Developers, n.e.c.	4.45	0.08	99.55
5063	Electrical Apparatus and Equipment	4.27	0.08	99.63
781	Landscape Counseling and Planning	10.78	0.07	99.70
8713	Surveying Services	7.69	0.06	99.76
1442	Construction Sand and Gravel	10.53	0.05	99.81
8711	Engineering Services	9.06	0.03	99.84
5039	Construction Materials, n.e.c.	6.29	0.02	99.87
1741	Masonry and Other Stonework	7.25	0.02	99.89
5033	Roofing, Siding, and Insulation Materials	4.83	0.02	99.91
7699	Repair Shops and Related Services, n.e.c.	5.79	0.02	99.92
3272	Concrete Products, n.e.c.	8.61	0.01	99.94
5983	Fuel Oil Dealers	4.26	0.01	99.95
8734	Testing Laboratories	14.45	0.01	99.96
5082	Construction and Mining Equipment	4.31	0.01	99.96
181	Ornamental Nursery Products	17.47	0.01	99.97
5171	Petroleum Bulk Stations and Terminals	4.21	0.01	99.97
3446	Architectural Metal Work	4.95	<0.01	99.98
5032	Brick, Stone, and Related Construction Materials	7.88	<0.01	99.98
3699	Electrical Equipment and Supplies, n.e.c.	6.17	<0.01	99.99
3271	Concrete Brick and Block	3.23	<0.01	99.99
5084	Industrial Machinery and Equipment	6.27	<0.01	99.99
1459	Clay and Related Minerals, n.e.c.	16.67	<0.01	99.99
5169	Chemicals and Allied Products, n.e.c.	6.95	<0.01	99.99
8712	Architectural Services	9.59	<0.01	100.00
4952	Sewerage Systems	1.82	<0.01	100.00
2411	Logging Camps and Logging Contractors	2.20	<0.01	100.00
1742	Plastering, Dry Wall, and Insulation	6.82	<0.01	100.00
3444	Sheet Metal Work	10.24	<0.01	100.00
1761	Roofing, Siding, and Sheet Metal Work	5.75	<0.01	100.00
1522	Residential Construction, n.e.c.	6.70	<0.01	100.00
3599	Industrial Machinery, n.e.c.	6.87	<0.01	100.00
8748	Business Consulting, n.e.c.	11.93	<0.01	100.00

SIC Code	SIC Description	Per-centage Listed DBE	Industry Weight	Industry Weight (Cumu-lative)
3471	Plating and Polishing	4.55	<0.01	100.00
783	Ornamental Shrub and Tree Services	4.50	<0.01	100.00
7371	Computer Programming Services	11.73	<0.01	100.00
2421	Sawmills and Planing Mills, General	2.48	<0.01	100.00
	TOTAL (Unweighted)	7.09		

Table 5C. Consulting—Listed DBE Percentage and Industry Weight, by SIC Code

SIC Code	SIC Description	Per-centage Listed DBE	Industry Weight	Industry Weight (Cumu-lative)
8711	Engineering Services	9.06	84.39	84.39
8734	Testing Laboratories	14.45	6.35	90.74
8712	Architectural Services	9.59	2.96	93.70
8741	Management Services	13.68	2.16	95.86
1741	Masonry and Other Stonework	7.25	1.01	96.87
8713	Surveying Services	7.69	0.90	97.77
3699	Electrical Equipment and Supplies, n.e.c.	6.17	0.56	98.33
1629	Heavy Construction, n.e.c.	6.91	0.42	98.75
8743	Public Relations Services	33.33	0.37	99.12
8748	Business Consulting, n.e.c.	11.93	0.33	99.45
6552	Subdividers and Developers, n.e.c.	4.45	0.15	99.60
7335	Commercial Photography	12.21	0.15	99.75
7389	Business Services, n.e.c.	10.00	0.14	99.88
5063	Electrical Apparatus and Equipment, Wiring Supplies, and Construction Materials	4.27	0.08	99.97
1731	Electrical Work	9.21	0.02	99.99
1799	Special Trade Contractors, n.e.c.	6.78	0.01	100.00
	TOTAL (Unweighted)	8.31		

Table 5D. Off-Systems—Listed DBE Percentage and Industry Weight, by SIC Code

SIC Code	SIC Description	Per-centage Listed DBE	Industry Weight	Industry Weight (Cumu-lative)
1611	Highway and Street Construction	12.04	24.26	24.26
1622	Bridge, Tunnel, and Elevated Highway	5.13	22.10	46.35
1794	Excavation Work	7.24	14.69	61.04
1771	Concrete Work	7.19	11.43	72.48
1623	Water, Sewer, and Utility Lines	9.23	6.02	78.49
1542	Nonresidential Construction, n.e.c.	8.37	5.30	83.80
1629	Heavy Construction, n.e.c.	6.91	3.42	87.22
782	Lawn and Garden Services	6.77	3.27	90.49
1731	Electrical Work	9.21	3.12	93.61
3273	Ready-Mixed Concrete	6.09	1.44	95.05
1521	Single-Family Housing Construction	4.67	1.08	96.13
5051	Metals Service Centers and Offices	7.18	1.05	97.18
1791	Structural Steel Erection	16.82	0.86	98.05
4212	Local Trucking Without Storage	8.34	0.73	98.78
1541	Industrial Buildings and Warehouses	9.05	0.39	99.17
7359	Equipment Rental and Leasing, n.e.c.	7.99	0.30	99.47
8711	Engineering Services	9.06	0.22	99.69
3272	Concrete Products, n.e.c.	8.61	0.18	99.86
1721	Painting	8.86	0.06	99.92
5063	Electrical Apparatus and Equipment,	4.27	0.04	99.97
5172	Petroleum Products Wholesalers	3.91	0.02	99.98
3446	Architectural Metal Work	4.95	0.02	100.00
	TOTAL (Unweighted)	7.12		

For two reasons, the percentages in the four previous tables are not suitable as availability measures. First, it is likely that some proportion of the DBEs listed in the tables are not actually minority-owned or woman-owned. Second, it is likely that there are additional "unlisted" DBEs among all the businesses included in Tables 3A-3D. Such businesses do not appear in any of the

directories we gathered and are therefore not included as DBEs in Tables 4A-4D. Additional steps are required to test these two conditions and to arrive at a more accurate representation of DBE availability in MO-KC-STL. We discuss these steps in Sections III.C and III.D below.

C. Verify Listed DBEs and Estimate Unlisted DBEs

One likelihood that must be addressed when using information on DBEs from *MarketPlace* and other DBE directories is that not all the information is correct. Phenomena such as ownership changes, associate or mentor status, recording errors, or even outright misrepresentation could lead to businesses being listed as DBEs in a particular directory even though they are actually owned by white males. Other things equal, this type of error would cause our availability estimate to be biased upward from the "true" availability number.

The second likelihood that must be addressed is that not all DBE businesses are necessarily listed—either in *MarketPlace* or in any of the other directories we collected. Such phenomena as geographic relocation, ownership changes, directory compilation errors, and limitations in DBE outreach could all lead to DBEs being unlisted. Other things equal, this type of error would cause our availability estimate to be biased downward from the "true" availability number.

In our experience, we have found that both types of bias are not uncommon. For this study, we attempted to correct for the effect of these biases using statistical sampling procedures. We surveyed a large stratified random sample of 2,100 relevant businesses by telephone and measured how often they were misclassified (or unclassified) by race and/or sex.[24]

Strata were defined according to SIC code groups and listed DBE status.[25] The survey was conducted by telephone during May and June 2004. Up to ten attempts were made to reach each

[24] A very similar methodology has been employed by the Federal Reserve Board to deal with similar problems in designing and implementing the National Surveys of Small Business Finances for 1993 and 1998. *See* Catherine Haggerty, Karen Grigorian, Rachel Harter and John D. Wolken. "The 1998 Survey of Small Business Finances: Sampling and Level of Effort Associated with Gaining Cooperation from Minority-Owned Business," *Proceedings of the Second International Conference on Establishment Surveys,* Buffalo, N.Y., June 17-21, 2000.

[25] Three separate SIC strata were created according to industry weight. SIC codes with larger weights were sampled with higher probability. SIC codes 1611 (highway & street construction) and 1622 (bridge, tunnel & elevated highway construction) were sampled with 100 percent probability. Together, these three strata account for more than 95 percent of all MoDOT contracting dollars. A fourth stratum was added to capture all remaining SIC codes. All four strata were then split according to listed DBE status to create a total of eight strata. Generally, listed DBEs were sampled at a higher rate than unclassified establishments.

business and speak with an appropriate respondent. Attempts were scheduled for a mix of day and evening, weekdays and weekends, and appointments were scheduled for callbacks when necessary. Of the 2,100 firms in our sample, 432 were listed DBEs and 1,668 were unclassified by race or sex. However, 333 establishments were excluded as "unable to contact." These resulted primarily from wrong phone numbers and phone numbers that had been disconnected or were no longer in service. Of the remaining 1,767 firms, 365 were listed DBEs, and the remaining 1,431 establishments were unclassified.

The first part of the survey tested whether our sample of listed DBEs was correctly classified by race and/or sex. The second part of the survey tested whether the unclassified firms could all be properly classified as non-DBEs. Both elements of the survey are described in more detail below.

1. Survey of Listed DBEs

We selected a stratified random sample of 432 listed DBEs to verify the race and gender status of their owner(s). Of these, 97 (22.5%) were excluded as "unable to contact." Of the 335 remaining establishments, we obtained complete interviews from 242, for a response rate of 72.2 percent.

Of the 242 establishments interviewed, 44 (18.2%) were owned by White males. The amount of misclassification was substantial in every SIC stratum, as shown in Table 6A. Misclassification was also substantial in each Highway District, as shown in Table 6B. Misclassification varied by putative race and sex as well, as shown in Table 6C.

Table 6A. Listed DBE Survey—Amount of Misclassification, by SIC Code Grouping

Listed DBE By SIC Code Grouping	Misclassification (Percentage White Male)	Percentage Actually DBE-owned	Number of Businesses Interviewed
Stratum 1	15.8	84.2	38
Stratum 2	17.4	82.6	69
Stratum 3	15.8	84.2	57
Stratum 4	21.8	78.2	78
All SIC Codes	18.2	81.8	242

Source: NERA telephone survey conducted in May and June 2004.

Table 6B. Listed DBE Survey—Amount of Misclassification, by Highway District

Highway District	Misclassification (Percentage White Male)	Number of Businesses Interviewed
District 1 (Northwest)	50.0	2
District 2 (North Central)	20.0	5
District 3 (Northeast)	33.3	6
District 4 (Kansas City Area)	16.3	49
District 5 (Central)	9.5	21
District 6 (St. Louis Area)	12.7	63
District 7 (Southwest)	36.4	11
District 8 (Springfield Area)	35.3	17
District 9 (South Central)	33.3	6
District 10 (Southeast)	28.6	14
KC-STL (KS-IL portion only)	12.5	48
Entire Region	18.2	242

Source: See Table 6A.

Table 6C. Listed DBE Survey—Amount of Misclassification, by Putative DBE Type

Putative Race/Sex	Misclassification (Percentage White Male)	Misclassification (Percentage Other DBE Type)	Percentage Correctly Classified	Number of Businesses Interviewed
Black (either sex)	3.1	18.8	78.1	11
Asian (either sex)	9.1	18.2	72.7	32
Hispanic (either sex)	22.2	11.1	66.7	18
Native American (either sex)	0.0	25.0	75.0	4
White Female	21.7	2.9	75.4	175
All DBE Types	18.2	N/A	81.8%	242

Source: See Table 6A.

The race and gender status of the listed DBEs that responded to the survey was changed, if necessary, according to the survey results. For example, if a business originally listed as a White female DBE was actually owned by a White male, then that business was counted as a White male for purposes of calculating DBE availability. But what about the remaining putative White female-owned establishments that we did not interview? For these businesses, we must estimate their DBE status since we did not directly obtain it (because we did not interview them). We base our estimates on the amount of misclassification we observed among the White female-owned firms that we succeeded in interviewing. In this example, our interviews show that 75.4 percent of these firms are White female-owned, 21.7 percent are White male-owned, and 2.9 percent are minority-owned. Therefore, we assign each of the remaining firms a 75.4 percent probability of being White female-owned, a 21.7 percent probability of being White male-owned, and a 2.9 percent probability of being minority-owned.

We performed this procedure within each sample stratum and for all putative race and sex categories. Tables 6D through 6H show the estimated probabilities by strata for each type of listed DBE.

Table 6D. Listed DBE Survey—Black-Owned By SIC Code Grouping

Black-Owned (Either Sex) By SIC Code Grouping	Misclassification (Percentage White Male)	Misclassification (Percentage Other DBE Type)	Percentage Correctly Classified	Number of Businesses Interviewed
Stratum 1	14.3	14.3	71.4	7
Stratum 2	0.0	11.1	88.9	9
Stratum 3	0.0	20.0	80.0	10
Stratum 4	0.0	33.3	66.7	6
All Strata	3.1	18.8	78.1	32

Source: See Table 6A.

Table 6E. Listed DBE Survey—Asian-Owned By SIC Code Grouping

Asian-Owned (Either Sex) By SIC Code Grouping	Misclassification (Percentage White Male)	Misclassification (Percentage Other DBE Type)	Percentage Correctly Classified	Number of Businesses Interviewed
Stratum 1	0.0	50.0	50.0	2
Stratum 2	0.0	0.0	100.0	6
Stratum 3	N/A	N/A	N/A	N/A
Stratum 4	33.3	33.3	33.3	3
All Strata	9.1	18.2	72.7	11

Source: See Table 6A.

Table 6F. Listed DBE Survey—Hispanic-Owned By SIC Code Grouping

Hispanic-Owned (Either Sex) By SIC Code Grouping	Misclassification (Percentage White Male)	Misclassification (Percentage Other DBE Type)	Percentage Correctly Classified	Number of Businesses Interviewed
Stratum 1	0.0	0.0	100.0	1
Stratum 2	50.0	0.0	50.0	4
Stratum 3	14.3	14.3	71.4	7
Stratum 4	16.7	16.7	66.7	6
All Strata	22.2	11.1	66.7	18

Source: See Table 6A.

Table 6G. Listed DBE Survey—Native American-Owned By SIC Code Grouping

Native American-Owned (Either Sex) By SIC Code Grouping	Misclassification (Percentage White Male)	Misclassification (Percentage Other DBE Type)	Percentage Correctly Classified	Number of Businesses Interviewed
Stratum 1	0.0	50.0	50.0	2
Stratum 2	0.0	0.0	100.0	1
Stratum 3	N/A	N/A	N/A	N/A
Stratum 4	0.0	0.0	100.0	1
All Strata	0.0	25.0	75.0	4

Source: See Table 6A.

Table 6H. Listed DBE Survey—White Female-Owned By SIC Code Grouping

White Female-Owned (Either Sex) By SIC Code Grouping	Misclassification (Percentage White Male)	Misclassification (Percentage Other DBE Type)	Percentage Correctly Classified	Number of Businesses Interviewed
Stratum 1	19.2	0.0	80.8	26
Stratum 2	20.4	2.0	77.6	49
Stratum 3	20.5	5.1	74.4	39
Stratum 4	24.6	3.3	72.1	61
All Strata	21.7	2.9	75.4	175

Source: See Table 6A.

2. Survey of Unclassified Businesses

In a manner exactly analogous to our survey of listed DBEs, in the second part of our survey we examined unclassified businesses, *i.e.* any business that was not originally identified as a DBE, either in *MarketPlace* or in one or more of the other directories collected for this study.

We selected a stratified random sample of 1,668 listed DBEs to verify the race and gender status of their owner(s). Of these, 237 (14.2%) were excluded as "unable to contact." Of the 1,431 remaining establishments, we obtained complete interviews from 976, for a response rate of 68.2 percent.

Of the 976 establishments interviewed, 870 (89.1%) were owned by White males, 78 (8.0%) by White females, and 28 (2.9%) by minorities. A similar phenomenon was observed within each stratum (Table 7A) as well as within each highway district (Table 7B).

Table 7A. Unclassified Businesses Survey—By SIC Code Grouping

Unclassified Businesses By SIC Code Grouping	Percentage DBE	Percentage Actually White Male-owned	Number of Businesses Interviewed
Stratum 1	9.5	90.5	294
Stratum 2	7.5	92.5	239
Stratum 3	17.6	82.4	222
Stratum 4	9.5	90.5	221
All Strata	10.9	89.1	976

Source: NERA telephone survey conducted in May and June 2004.

Table 7B. Unclassified Businesses Survey—By Highway District

Highway District	Percentage DBE	Percentage Actually White Male-owned	Number of Businesses Interviewed
District 1 (Northwest)	12.2	87.8	41
District 2 (North Central)	8.7	91.3	23
District 3 (Northeast)	7.4	92.6	54
District 4 (Kansas City Area)	9.1	90.9	153
District 5 (Central)	8.9	91.1	79
District 6 (St. Louis Area)	10.6	89.4	245
District 7 (Southwest)	16.7	83.3	48
District 8 (Springfield Area)	6.8	93.2	73
District 9 (South Central)	15.4	84.6	26
District 10 (Southeast)	11.5	88.5	61
KC-STL (KS-IL portion only)	13.9	86.1	173
Entire Region	10.9	89.1	976

Source: See Table 7A.

As with the survey of listed DBEs, the race and gender status of unclassified businesses was changed, if necessary, according to the survey results. For example, if an interviewed business that was originally unclassified indicated that they were actually owned by a White male, then that business was counted as a White male for purposes of the DBE availability calculation. If they indicated they were White female-owned, they were counted as White female, and so on. For unclassified businesses that were not interviewed, we assigned probability values (probability actually White male-owned, probability actually White female-owned, probability actually Black-owned, etc.) based on the interview responses. We again carried out the probability assignment procedure within each stratum.

Clearly, the large majority of unclassified businesses (over 89 percent overall) are White male-owned. Of those that were not White male-owned, the large majority were owned by White females. Table 7C shows the actual survey results by race and sex.

Table 7C. Unclassified Businesses Survey—By Race and Sex

Verified Race/Sex	Number of Businesses Interviewed	Percentage of Total
White Male	870	89.1
White Female	78	8.0
Asian	6	0.6
Hispanic	7	0.7
Black	6	0.6
Native American	9	0.9
Entire Region	976	100.0

Source: See Table 7A.

IV. ESTIMATING BASELINE DBE AVAILABILITY

All the steps necessary to calculate overall weighted average DBE availability are now complete.[26] We briefly summarize each step below. Table 8A details the results from each step for all MoDOT federally-assisted contracting activity. Tables 8B-8D repeat the process for construction, consulting, and off-systems contracts.

Identify the relevant geographic market. Determine the states and counties where prime contractors and subcontractors are located based on MoDOT's contract expenditure data. Identify the geographic areas that account for the majority of MoDOT's contract and subcontract activity.

Identify the relevant product market and associated industry weights. Determine which SIC codes best represent contracting and subcontracting opportunities on MoDOT projects with federal participation, based on expenditure data for MoDOT's construction, consulting, and off-systems contracts and subcontracts. Next, calculate the dollar value attributable to each SIC code as a percentage distribution. The resulting percentage figures are used to calculate industry-weighted DBE availability. In contrast to an unweighted figure, the industry-weighted DBE availability figure gives greater weight to DBE availability from those industries where MoDOT spends more contract dollars, and lesser weight to availability in those industries where fewer dollars are spent.

Count all businesses in the relevant geographic and product market. Determine the total number of businesses in each relevant SIC code, state, and county from Dun & Bradstreet's *MarketPlace*. This determination was made overall as well as separately for construction, consulting, and off-systems.

Identify "listed" DBE businesses in relevant markets. Some DBEs were directly identified in Dun & Bradstreet's *MarketPlace* or in MoDOT's DBE directory. Other businesses in *MarketPlace* were identified as DBEs by cross-referencing name and address information from numerous regional directories of minority- and women-owned firms collected for this study. This determination was made overall as well as separately for construction, consulting, and off-systems.

Verify ownership status of listed DBEs. To correct for race and sex misclassification, conduct interviews with listed DBEs to verify ownership status. Calculate the percentage of listed DBEs that are actually owned by White males. Separate calculations were made by SIC code

[26] Although not detailed below, we also provide analogous calculations by Highway District.

grouping and by race and sex.

Verify ownership status of unclassified firms. To correct for race and sex misclassification, conduct interviews with businesses that were not listed as DBEs in order to determine their ownership status. Calculate the percentage of unclassified businesses that are actually owned by DBEs and by non-DBEs. Separate calculations were made by SIC code grouping and by race and sex.

Table 8A. Calculation Summary—Overall

Step / Calculation	Number of Businesses	Percentage of Total
All Businesses	45,555	100.00
Listed DBEs	3,293	7.23
Listed DBEs (with industry weights)	4,391	9.64
Listed DBEs (corrected for misclassification)	2,666	5.85
Listed DBEs (corrected for misclassif.; with industry weights)	2,637	5.79
Unlisted DBEs (corrected for misclassification)	4,879	10.71
Unlisted DBEs (corrected for misclassif.; with industry weights)	4,495	9.87
All DBEs (unweighted)	7,545	16.56
All DBEs (with industry weights)	7,893	***17.32***

Table 8B. Calculation Summary—Construction

Step / Calculation	Number of Businesses	Percentage of Total
All Businesses	45,002	100.00
Listed DBEs	3,190	7.09
Listed DBEs (with industry weights)	4,364	9.70
Listed DBEs (corrected for misclassification)	2,586	5.75
Listed DBEs (corrected for misclassif.; with industry weights)	2,545	5.66
Unlisted DBEs (corrected for misclassification)	4,836	10.75
Unlisted DBEs (corrected for misclassif.; with industry weights)	4,535	10.08
All DBEs (unweighted)	7,422	16.49
All DBEs (with industry weights)	7,889	***17.52***

Table 8C. Calculation Summary—Consulting

Step / Calculation	Number of Businesses	Percentage of Total
All Businesses	10,301	100.00
Listed DBEs	856	8.31
Listed DBEs (with industry weights)	939	9.12
Listed DBEs (corrected for misclassification)	703	6.82
Listed DBEs (corrected for misclassif.; with industry weights)	724	7.03
Unlisted DBEs (corrected for misclassification)	1,201	11.66
Unlisted DBEs (corrected for misclassif.; with industry weights)	704	6.83
All DBEs (unweighted)	1,904	18.48
All DBEs (with industry weights)	1,492	***14.48***

Table 8D. Calculation Summary—Off-Systems

Step / Calculation	Number of Businesses	Percentage of Total
All Businesses	24,406	100.00
Listed DBEs	1,737	7.12
Listed DBEs (with industry weights)	1.946	7.97
Listed DBEs (corrected for misclassification)	1,424	5.83
Listed DBEs (corrected for misclassif.; with industry weights)	1,411	5.78
Unlisted DBEs (corrected for misclassification)	2,814	11.53
Unlisted DBEs (corrected for misclassif.; with industry weights)	2,443	10.01
All DBEs (unweighted)	4,239	17.37
All DBEs (with industry weights)	4,001	***16.39***

Table 8A shows a total of 45,555 businesses operating in the 71 SIC codes within MoDOT's geographic market (*see* Table 3A). Of these, 7.23 percent were listed DBEs. With industry weights, the percentage grows to 9.64 percent. This increase occurs primarily because the proportion of listed DBEs in certain industries exceeds the overall average. In particular, the proportion of listed DBEs in SIC 1611, at 12.04 percent, is significantly higher than the average of 7.23 percent. Our misclassification survey found that almost 20 percent of listed DBEs were not actually DBEs. Our survey also found that almost 12 percent of unclassified firms were actually DBEs. Combining these two groups of DBEs yields availability of 16.56 percent, which then rises slightly to the final overall baseline availability figure of 17.32 percent when industry weights are applied. Tables 8B–8D provide similar derivations for construction, consulting, and off-systems.

The final results of our baseline DBE availability analysis for MoDOT are shown in Table 9. Overall, DBE availability for MoDOT construction contracts is estimated to be 17.52 percent. Availability for consulting contracts is estimated to be 14.48 percent. Availability for off-systems contracts is estimated to be 16.39 percent. Overall, combining all three contract categories, availability is estimated to be 17.32 percent. Availability results are also presented by highway districts and by the business owner(s) race and sex.

Table 9. Estimated DBE Availability for MoDOT

Geographic Region	Construction	Consulting	Off-Systems	Overall
District 1 (Northwest)	13.24	6.76	11.94	13.08
District 2 (North Central)	15.75	8.03	13.91	15.61
District 3 (Northeast)	7.37	11.20	10.11	7.46
District 4 (Kansas City Area)	16.96	16.00	17.18	16.91
District 5 (Central)	17.20	15.81	14.95	17.10
District 6 (St. Louis Area)	18.86	15.29	17.52	18.52
District 7 (Southwest)	14.96	9.40	13.10	14.77
District 8 (Springfield Area)	16.01	10.49	14.51	15.72
District 9 (South Central)	13.59	22.56	14.76	14.06
District 10 (Southeast)	19.22	12.83	17.14	19.05
KC-STL (KS-IL portion only)	21.44	13.43	19.70	20.75
White Male	82.48	85.52	83.61	82.48
Asian	0.72	2.32	0.86	0.82
Black	2.08	1.65	1.75	2.05
Hispanic	1.08	0.63	0.69	1.05
Native American	1.30	1.17	1.16	1.29
White Female	12.33	8.71	11.92	12.11
ENTIRE GEOGRAPHIC MARKET AREA	17.52	14.48	16.39	17.32

Source: (i) NERA calculations from MoDOT contract databases; (ii) Dun & Bradstreet's *MarketPlace*; (iii) business directory information compiled by NERA; and (iv) NERA telephone surveys.

V. ADJUSTING BASELINE DBE AVAILABILITY

The availability figures reported in the previous section represent the percentage of businesses in MoDOT's construction and construction-related markets that are DBEs. These figures may be artificially low if discrimination has made minorities and women more reluctant to start businesses or if it has made the businesses they start less profitable and therefore more likely to fail. For this reason, the revised federal DBE regulations require recipients of federal funds to consider whether an adjustment to the baseline DBE availability figures such as those reported above in Table 9 would be necessary in order to approximate the amount of DBE availability that would be expected in a race and sex neutral marketplace (the Step 2 adjustment). Specifically, recipients must examine the volume of work DBEs have performed for them in the past as well as evidence from any disparity studies conducted within the recipient's jurisdiction to the extent not relied upon for the Step 1 estimate. If available, recipients must also consider "evidence from related fields that affect the opportunities for DBEs to form, grow and compete."[27]

To meet these requirements, this final section of the Study summarizes evidence from the MO-KC-STL area relevant to whether an adjustment is warranted and, if so, what size adjustment is appropriate.[28] First, we consider the findings of previous disparity studies that have been conducted for the State of Missouri or for other governments in the Missouri region. Second, we present statistical evidence of disparities in business formation and business owner earnings, based on microdata from the 2000 Decennial Census and the 1979-2002 Current Population Surveys. We use the business formation disparities as the basis for quantifying the amount of adjustment consistent with a race-neutral marketplace.

A. Evidence from Previous Missouri Area Disparity Studies

As required by 49 CFR § 26.45(d)(1)(ii), we examined disparity studies conducted in the State of Missouri. The first, "Discrimination and Disparities in the Market Place, City of St. Louis, Missouri," was performed by Brimmer & Company, Inc., and completed in 1991. The Study's objective was "to produce accurate numerical measurements of the industry participation of black-owned and female-owned construction businesses relative to the availability of such businesses in

[27] 49 CFR § 26.45 (d) (2).

[28] We also examined the past volume of work done for MoDOT by DBE prime contractors and subcontractors. NERA's estimates of DBE availability are substantially higher than average DBE utilization levels achieved by MoDOT between FFY1999 and FFY2003.

the St. Louis MSA, in order to determine whether race and gender disparities are present in the local construction industries, and if so, to gauge their magnitude."[29] The primary data sources were the Census Bureau's Census of Construction Industries, the Survey of Minority-Owned Business Enterprises and the Survey of Women-Owned Business Enterprises. The Study calculated disparity indices for employer and non-employer proprietorships, partnerships and subchapter S corporations in SIC groups 15, 16 and 17 and SIC code 6552 for the St. Louis MSA for 1977, 1982 and 1987. Black-owned and female-owned businesses were compared to the overall universe to develop the disparity measures. Although there were several exceptions, "in the great majority of cases, large disparities between market share and firm share are found to exist in the construction industries for both black-owned and female-owned business enterprises (employers and nonemployers alike) in the St. Louis MSA, in the State of Missouri, and in the United States as a whole."[30]

St. Louis commissioned another study, completed in 1996 and performed by Jones & Strong, Attorneys at Law. Comparing total City purchasing from prime vendors with total availability of minority- and women-owned firms as defined by the City's certification and bidders lists, the Study found underutilization of MBEs and WBEs. Disparities were found both in the number of purchases made from MBEs and WBEs and the total dollars paid to those firms. The study also randomly surveyed MBEs and WBEs about their perceptions of discrimination regarding seeking City contracts, personal encounters as they sought contracting opportunities, and the respondents "capacity" as measured by the firms' revenues, employees and owners' educational achievements. The survey results documented evidence of discrimination suffered by MBEs and WBEs, including stereotypical attitudes; discrimination in past employment affecting entrepreneurship; unequal access to financing and bonding; double standards in performance evaluations; denial of opportunities to bid; bid shopping; bid manipulation; unfair denial of contract awards; harassment; union discrimination and sabotage; payment discrimination; exclusion from the "Good Old Boys" network; unfair pricing by suppliers; and lack of private sector opportunities.

The City of St. Louis joined with the St. Louis Housing Authority and the Metropolitan St. Louis Sewer District to perform another study, submitted by MGT of America, Inc. and completed in 2001. The Study used the entities' certification and vendor lists to define the availability of

[29] p. 33, Part IV.

[30] *Ibid.,* p. 67.

MBEs and WBEs. Utilization was determined by government contract awards and payments data. Results varied by jurisdiction but overall showed underutilization of MBEs and WBEs in most categories. Further, MBEs and WBEs earned significantly fewer revenues than non-M/WBEs even after accounting for capacity, managerial ability and experience.

These Missouri area studies suggest that the availability of DBEs in and around Missouri to do business with the public sector has been depressed by the persistent effects of historical and marketplace discrimination, and that those businesses that have been formed have been underutilized due to discrimination. For purposes of quantifying a Step 2 adjustment factor, however, we do not rely upon these studies because of their age. For more current data to quantify such an adjustment, we turn to Census microdata, as described in the next section.

B. Race and Sex Disparities in Earnings

The purpose of this section is to determine whether minority and female entrepreneurs earn less from their businesses than do their White male counterparts. Other things equal, if minority and female business owners as a group have lower earnings from their businesses than comparable non-minorities, minority and female business failure rates should be higher and minority and female business formation rates should be lower than those that would be observed in a race-neutral marketplace. Both would lead to lower levels of minority and female business ownership. Below, we first consider earnings disparities among wage and salary employees (*i.e.*, non-business owners). Next, we compare differences in hourly-equivalent earnings among the self employed (*i.e.*, business owners). In each case, we examine the U.S. as a whole and MO-KC-STL specifically. We also consider the economy as a whole as well as the construction and architecture/engineering sector specifically.

1. Methods

To assess whether minorities or women earn less than Whites or males with similar characteristics, we use a statistical technique known as linear regression. Linear regression is used to estimate the effect of each of a set of observable characteristics (such as education and age) on an outcome variable of interest (hourly earnings in this case). This technique allows us to measure the percentage difference in earnings between two or more race/sex groups while simultaneously holding constant the relationship between earnings and other important characteristics. That is, we can compare individual business owners who have similar years of education, who are of similar

ages (*i.e.* have similar potential labor market experience), and who share other demographic characteristics. Econometric analysis of this type requires individual-level data (*i.e.* "microdata") with relevant information on self-employment status and other socioeconomic characteristics. Currently there are two primary sources of such data.

2. Data

The first source is the Five Percent Public Use Microdata Samples (PUMS) from the 2000 decennial census. The 2000 PUMS contains observations representing five percent of all U.S. housing units and the persons in them (the equivalent of approximately 14 million records). Released in late 2003, the PUMS provides the full range of population and housing information collected in the 2000 census. Business ownership is identified in the PUMS through the "class of worker" variable, which distinguishes the unincorporated and incorporated self-employed from other types of employed persons. The presence of the class of worker variable allows us to construct a detailed cross-sectional sample of individual business owners and their earnings.

The second source of data is the Current Population Survey (CPS). The CPS has been conducted monthly by the Census Bureau and the Bureau of Labor Statistics for over 40 years, and is a primary source of official government statistics on employment and unemployment. Currently, about 56,500 households are scientifically selected for the CPS on the basis of area of residence in order to represent the nation as a whole, individual states, and the largest metropolitan areas. In addition to information on employment status, the CPS collects information on age, sex, race, marital status, educational attainment, earnings, occupation, industry, and other characteristics. These statistics serve to update similar information collected once every 10 years through the decennial census.[31]

[31] Since 1979, about a quarter of the households in each monthly CPS survey have been asked to provide additional information, including usual weekly earnings and weekly hours of work. These households are said to be in "Outgoing Rotation Groups" (ORG) because of the way the CPS rotates households for interviews. Each household selected for the survey is interviewed once a month for four consecutive months, not interviewed for eight months, and interviewed again once a month for four more months. The households in the ORG are those that are in either the fourth or the eighth survey. The ORG files of the CPS include individual data for about 30,000 individuals each month, or over 350,000 per year. Data are available in a comparable form from 1979 through 2002. Data from the ORG files are used below in addition to the PUMS to examine earnings disparities among wage and salary workers. Unfortunately the ORG files do not contain data on the earnings of the self-employed. Annual earnings, whether from wages or self-employment are available from the March CPS, however, also known as the Annual Demographic File. This file also contains the basic monthly demographic and labor force data. In the March CPS, data on employment, earnings, and income refer to the preceding year,

(continued...)

3. Findings: Race and Sex Disparities in Wage and Salary Earnings

Table 10 reports the results from our regression analyses of hourly earnings among wage and salary workers. Numbers shown in the table indicate the percentage difference between earnings of minorities (or White females) and comparable Whites (or White Males). Separate analyses were conducted for the U.S., Missouri, and MO-KC-STL, for both the economy as a whole as well as the construction and architecture/engineering sector. In the economy-wide analysis of the U.S. as a whole, the hourly earnings of women and of all minority groups are shown to be substantially lower than for White males who are similarly-situated with respect to age, education, industry, and geography. Differences appear to have worsened for minorities between the 1979-1991 period and the 1992-2002 period and lessened slightly for women. These results are all statistically significant.

Table 10. Hourly Earnings of Minority Groups Relative to Whites with Similar Personal Characteristics

United States – All Industries

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-11.2% (95.25)	-7.5% (51.92)	n/a	n/a	-9.2% (46.86)	-22.8% (357.94)	1,684,607
1992-2002	-12.8% (74.20)	-14.6% (83.32)	-12.3% (47.15)	-10.4% (18.05)	n/a	-17.7% (184.57)	904,629
2000	n/a[32]	n/a	n/a	n/a	n/a	n/a	n/a

(...continued)

although demographic data refer to the time of the survey. The March surveys are included for the years 1977-2002. Because the information relates to the preceding year, the earnings data relate to the years 1976-2001. The sample consists of any individual who reports positive self-employment earnings in the year preceding the interview.

[32] It was not practical to run regressions on the Five Percent 2000 PUMS for the U.S. as a whole due to the extremely large sample sizes.

State of Missouri – All Industries

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-4.9%	-0.9%	n/a	n/a	-9.3%	-22.7%	26,062
	(4.94)	(0.77)			(3.56)	(43.83)	
1992-2002	-7.9%	-8.3%	-12.6%	0.8%	n/a	-17.5%	11,851
	(4.98)	(2.64)	(3.36)	(0.14)		(22.02)	
2000	-13.7%	-10.9%	-14.4%	-17.7%	-19.4%	-20.2%	88,462
	(16.08)	(6.99)	(7.59)	(6.06)	(10.69)	(44.24)	

MO-KC-STL– All Industries

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-5.8%	-1.7%	n/a	n/a	-9.7%	-22.9%	50,784
	(7.68)	(1.07)			(5.79)	(62.66)	
1992-2002	-11.5%	-9.4%	-10.7%	-6.2%	n/a	-17.4%	17,872
	(9.64)	(4.40)	(3.79)	(1.26)		(26.79)	
2000	-14.1%	-10.4%	-13.8%	-17.7%	-19.8%	-20.1%	106,492
	(18.45)	(7.87)	(8.23)	(6.46)	(11.81)	(48.19)	

Notes: (1) Universe is all private sector wage and salary workers 16 years and older; (2) Reported number is the percentage difference between a given minority group (women) and non-minorities (men); (3) Results are derived from equations regressing (the natural logarithm of) hourly wage and salary income on age, age squared, educational attainment, industry, state, race and sex; (4) Number in parentheses is the absolute value of the associated t-statistic. T-statistics greater than 1.67 are statistically significant at a 90 percent confidence level. T-statistics greater than 1.99 are significant at 95 percent confidence. T-statistics greater than 2.64 are significant at 99 percent confidence; (5) An asterisk in place of a t-statistic indicates that, due to sample size limitations, the estimate was derived by including race- and sex-specific Missouri or MO-KC-STL interaction terms in the U.S. equations and that the given interaction was statistically significant. If the interaction was not statistically significant, the results from the corresponding U.S. regression are reported, since the U.S. and the Missouri or MO-KC-STL results are not statistically different; (6) Individuals with imputed earnings are excluded where identified; (7) For 1979-1991, "Other Race" includes Hispanics, Asian/Pacific Islanders, and American Indians/Alaska Natives. In 2000, "Other Race" includes persons identifying themselves as belonging in more than one racial category. For 1979-1991 and 1992-2002, "Female" includes all females regardless of race. For 2000, "Female" includes white females only.

Source: 2000: Five Percent PUMS; 1979-1991 and 1992-2002: Merged ORG files of the CPS.

Turning to the economy-wide table for Missouri (the second panel in Table 10), we see very similar results — negative, large and statistically significant wage disparities in virtually all categories. Differences for Blacks and Hispanics are somewhat lower in Missouri than in the U.S.

as a whole, while differences for women are similar. Once again, differences for minorities appear to have worsened over time while the large differences observed for women appear to have lessened somewhat. Similar results are observed in the MO-KC-STL area (the third panel in Table 10) as well, though the Black disparities in this region appear larger than for Missouri alone.

In Table 11, the analysis is restricted to the construction and architecture/engineering sector. Again we observe large and statistically significant adverse differences in almost every case. For Blacks, and women in Missouri and MO-KC-STL, the pay disparities in this sector are even larger than those observed in the economy as a whole. Other things equal, the large pay gaps by race and sex observed among wage and salary workers might give minorities and women an incentive to start businesses. As the next section demonstrates however, in many cases, the earnings gaps observed among the self-employed are even larger than those observed for wage and salary workers.

Table 11. Hourly Earnings of Minority Groups Relative to Whites with Similar Personal Characteristics

United States – Construction and Architecture/Engineering

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-19.8% (39.31)	-12.7% (24.38)	n/a	n/a	-6.2% (7.36)	-31.1% (94.65)	109,176
1992-2002	-17.2% (18.92)	-16.1% (26.60)	-8.4% (6.14)	-7.1% (4.45)	n/a	-22.8% (46.92)	61,135
2000	-19.3% (39.82)	-14.7% (41.35)	-9.6% (11.57)	-15.4% (12.73)	-12.7% (14.36)	-22.3% (71.57)	300,355

State of Missouri – Construction and Architecture/Engineering

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-19.8% (39.31)	-12.7% (24.38)	n/a	n/a	-6.2% (7.36)	-39.5% (*)	109,176
1992-2002	-17.2% (18.92)	-16.1% (26.60)	-8.4% (6.14)	-7.1% (4.45)	n/a	-31.1% (*)	61,135
2000	-20.4% (4.62)	-9.9% (1.63)	-7.9% (0.64)	-8.0% (0.70)	-16.4% (2.17)	-24.8% (11.00)	6,715

State of MO-KC-STL – Construction and Architecture/Engineering

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-20.5%	-1.8%	n/a	n/a	-12.3%	-35.1%	2,911
	(5.04)	(0.22)			(1.59)	(18.1)	
1992-2002	-17.2%	-16.1%	-8.4%	-7.1%	n/a	-31.1%	61,135
	(18.92)	(26.60)	(6.14)	(4.45)		(*)	
2000	-17.5%	-4.3%	-8.4%	7.5%	-20.0%	-24.9%	8,146
	(4.36)	(0.82)	(0.79)	(0.72)	(2.93)	(12.36)	

Notes: (1) Universe is all private sector wage and salary workers 16 years and older in the construction or architecture/engineering sector; (2) Reported number is the percentage difference between a given minority group (women) and non-minorities (men); (3) Results are derived from equations regressing (the natural logarithm of) hourly wage and salary income on age, age squared, educational attainment, industry, state, race and sex; (4) Number in parentheses is the absolute value of the associated t-statistic. T-statistics greater than 1.67 are statistically significant at a 90 percent confidence level. T-statistics greater than 1.99 are significant at 95 percent confidence. T-statistics greater than 2.64 are significant at 99 percent confidence; (5) An asterisk in place of a t-statistic indicates that, due to sample size limitations, the estimate was derived by including race- and sex-specific Missouri or MO-KC-STL interaction terms in the U.S. equations and that the given interaction was statistically significant. If the interaction was not statistically significant, the results from the corresponding U.S. regression are reported, since the U.S. and the Missouri or MO-KC-STL results are not statistically different; (6) Individuals with imputed earnings are excluded where identified; (7) For 1979-1991, "Other Race" includes Hispanics, Asian/Pacific Islanders, and American Indians/Alaska Natives. In 2000, "Other Race" includes persons identifying themselves as belonging in more than one racial category. For 1979-1991 and 1992-2002, "Female" includes all females regardless of race. For 2000, "Female" includes white females only.

Source: 2000: Five Percent PUMS; 1979-1991 and 1992-2002: Merged ORG files of the CPS.

4. Findings: Race and Sex Disparities in Self-Employment Earnings

Large race and sex disparities are observed among business owners as well as among wage and salary workers. Tables 12 and 13 report the results from our regression analyses of business owner hourly-equivalent earnings. Numbers shown in the tables indicate the percentage difference between annual earnings of minority business owners (or female business owners) and those of White or male business owners who are comparable in terms of age, education, hours and weeks worked, industry and geography. Separate analyses were conducted for the U.S., Missouri, and MO-KC-STL, and for the economy as a whole as well as the construction and architecture/engineering sector.

In the economy-wide tables for the U.S. as a whole, as well as for Missouri and MO-KC-STL, negative and statistically significant differences are observed for Blacks and for women in all datasets and all time periods, while results for other groups are more mixed. The business owner

earnings gaps for these two groups are also substantially larger than those observed for comparable wage and salary workers (see Table 10).

Large, negative and statistically significant business owner earnings gaps are observed in the construction and architecture/engineering sector as well (Table 13). With the exception of White females, however, the earnings gaps are somewhat smaller than those observed for wage and salary workers in this sector.

Table 12. Annual Earnings of Minority Business Owners Relative to Whites with Similar Personal Characteristics

United States – All Industries

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1977-1991	-11.8% (3.13)	n/a	n/a	n/a	20.5% (4.47)	-67.8% (71.81)	93,984
1992-2002	-31.0% (7.18)	n/a	n/a	n/a	6.2% (1.13)	-51.5% (26.28)	62,163
2000	-2.0% (1.68)	-6.1% (3.70)	-2.7% (2.05)	-17.1% (5.95)	-5.8% (3.01)	-22.2% (40.57)	293,257

State of Missouri – All Industries

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1977-1991	-11.8% (3.13)	n/a	n/a	n/a	20.5% (4.47)	-67.8% (71.81)	93,984
1992-2002	-31.0% (7.18)	n/a	n/a	n/a	6.2% (1.13)	-51.5% (26.28)	62,163
2000	-20.2% (2.18)	4.9% (0.30)	10.8% (0.61)	-46.9% (3.09)	-32.4% (2.51)	-35.7% (9.37)	6,148

MO-KC-STL – All Industries							
	African American	**Hispanic**	**Asian/ Pacific Isl.**	**Amer. Indian**	**Other Race**	**Female**	**Number of Obs.**
1977-1991	-11.8% (3.13)	n/a	n/a	n/a	20.5% (4.47)	-67.8% (71.81)	93,984
1992-2002	-31.0% (7.18)	n/a	n/a	n/a	6.2% (1.13)	-51.5% (26.28)	62,163
2000	-22.0% (2.72)	2.2% (0.16)	11.5% (0.75)	-48.5% (3.34)	-34.7% (2.90)	-35.8% (10.28)	7,089

Notes: (1) Universe is all private sector self-employed workers 16 years and older; (2) Reported number is the percentage difference between a given minority group (women) and non-minorities (men); (3) Results are derived from equations regressing (the natural logarithm of) hourly self-employment income on age, age squared, educational attainment, industry, state, race and sex; (4) Number in parentheses is the absolute value of the associated t-statistic. T-statistics greater than 1.67 are statistically significant at a 90 percent confidence level. T-statistics greater than 1.99 are significant at 95 percent confidence. T-statistics greater than 2.64 are significant at 99 percent confidence; (5) An asterisk in place of a t-statistic indicates that, due to sample size limitations, the estimate was derived by including race- and sex-specific Missouri or MO-KC-STL interaction terms in the U.S. equations and that the given interaction was statistically significant. If the interaction was not statistically significant, the results from the corresponding U.S. regression are reported, since the U.S. and the Missouri or MO-KC-STL results are not statistically different; (6) Individuals with imputed earnings are excluded where identified; (7) For 1979-1991, "Other Race" includes Hispanics, Asian/Pacific Islanders, and American Indians/Alaska Natives. In 2000, "Other Race" includes persons identifying themselves as belonging in more than one racial category. For 1979-1991 and 1992-2002, "Female" includes all females regardless of race. For 2000, "Female" includes white females only.

Source: 2000: Five Percent PUMS; 1979-1991 and 1992-2002: CPS Annual Demographic File.

Table 13. Annual Earnings of Minority Business Owners Relative to Whites with Similar Personal Characteristics

United States – Construction and Architecture/Engineering							
	African American	**Hispanic**	**Asian/ Pacific Isl.**	**Amer. Indian**	**Other Race**	**Female**	**Number of Obs.**
1977-1991	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1992-2002	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2000	-17.5% (7.10)	-12.3% (6.87)	-1.6% (0.38)	-14.9% (2.83)	-8.7% (2.33)	-34.4% (19.88)	52,061

State of Missouri – Construction and Architecture/Engineering

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1977-1991	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1992-2002	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2000	-17.5% (7.10)	-12.3% (6.87)	-1.6% (0.38)	-14.9% (2.83)	-8.7% (2.33)	-47.4% (4.46*)	52,061

MO-KC-STL – Construction and Architecture/Engineering

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1977-1991	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1992-2002	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2000	-17.5% (7.10)	-12.3% (6.87)	-1.6% (0.38)	-14.9% (2.83)	-8.7% (2.33)	-40.7% (4.03*)	52,061

Notes: (1) Universe is all private self-employed workers 16 years and older in the construction or architecture/engineering sector; (2) Reported number is the percentage difference between a given minority group (women) and non-minorities (men); (3) Results are derived from equations regressing (the natural logarithm of) hourly self-employment income age, age squared, educational attainment, industry, state, race and sex; (4) Number in parentheses is the absolute value of the associated t-statistic. T-statistics greater than 1.67 are statistically significant at a 90 percent confidence level. T-statistics greater than 1.99 are significant at 95 percent confidence. T-statistics greater than 2.64 are significant at 99 percent confidence; (5) An asterisk in place of a t-statistic indicates that, due to sample size limitations, the estimate was derived by including race- and sex-specific Missouri or MO-KC-STL interaction terms in the U.S. equations and that the given interaction was statistically significant. If the interaction was not statistically significant, the results from the corresponding U.S. regression are reported, since the U.S. and the Missouri or MO-KC-STL results are not statistically different; (6) Individuals with imputed earnings are excluded where identified; (7) For 1979-1991, "Other Race" includes Hispanics, Asian/Pacific Islanders, and American Indians/Alaska Natives. In 2000, "Other Race" includes persons identifying themselves as belonging in more than one racial category. For 1979-1991 and 1992-2002, "Female" includes all females regardless of race. For 2000, "Female" includes white females only.

Source: 2000: Five Percent PUMS; 1977-1991 and 1992-2002: CPS Annual Demographic File.

C. Race and Sex Disparities in Business Formation

Other things equal, the large and statistically significant adverse earnings differentials documented in the previous section for minority and female entrepreneurs should be associated

with a corresponding gap in their business formation rate compared to White males.[33] As Table 14 demonstrates, this is indeed the case. In this section we examine in more detail the question of whether more minority-owned or woman-owned firms would have been formed if minorities or women were as likely to form and survive in businesses as were similarly situated White males.

Table 14. Business Ownership Rates (Percentage)

White male	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	White female	Population
United States – All Industries							
15.40	5.64	7.56	10.76	9.17	10.15	9.12	15,780,231
State of Missouri – All Industries							
14.46	4.81	7.51	11.93	10.66	11.02	8.40	319,022
MO-KC-STL – All Industries							
14.17	4.78	6.39	11.59	10.51	10.62	8.37	381,124
United States – Construction & Architecture/Engineering							
26.56	16.42	12.88	18.20	17.24	21.73	16.93	2,756,603
State of Missouri – Construction & Architecture/Engineering							
24.77	13.22	15.38	13.51	28.84	31.44	20.47	55,495
MO-KC-STL – Construction & Architecture/Engineering							
24.22	13.91	12.86	11.70	28.47	29.35	19.21	65,537

Finally, at the end of this section we provide estimates of the level of overall minority and female business formation that would be expected in a race-neutral marketplace. In accordance with the revised DBE regulations, these estimates can assist MoDOT in determining how much, if any, adjustment to baseline DBE goals may be warranted, based on marketplace evidence.[34]

[33] We use the phrases "business formation rates" and "self-employment rates" interchangeably in this report.

[34] 49 CFR § 26.45 (d).

1. Methods and Data

To see if minorities or White women are as likely to be self-employed as are comparable White males, we use a statistical technique known as Probit regression. Probit regression is used to determine the relationship between a categorical variable—one that can be characterized in terms of a yes or no response as opposed to a continuous number—and a set of characteristics that are related to the outcome of the categorical variable. Probit regression produces estimates of the extent to which each characteristic is positively or negatively related to the likelihood that the categorical variable will be a yes or no. For example, Probit regression is used by statisticians to estimate the likelihood that an individual participates in the labor force, retires this year, or contracts a particular disease—these are all variables that can be categorized by a response of yes (for example, she is in the labor force) or no (for example, she is not in the labor force)—and the extent to which certain factors are positively or negatively related to the likelihood (for example, the more education she has, the more likely that she is in the labor force).[35] In the present case, Probit regression is used to examine the relationship between the choice to own a business (yes or no) and economic and demographic characteristics including race and sex. The underlying data for this section are once again the CPS merged ORG sample (1979-1991 and 1992-2002) and the 2000 PUMS. Ultimately, however, the Step Two adjustment figures are calculated using the PUMS only.

2. Findings: Race and Sex Disparities in Business Formation

Tables 15 and 16 report the results from our Probit analyses of business formation probabilities. Numbers shown in the table indicate percentage point differences from comparable White males in the probability of being a business owner.

Considering the economy as a whole, large and statistically significant business formation disparities are observed for Blacks, Hispanics, and women. Results for Asians and Native Americans are mixed. When the construction and architecture/engineering sector is examined, once again generally large and statistically significant business formation disparities are observed for Blacks, Hispanics and women, while mixed results are observed for other groups. Moreover, the

[35] Probit regression is one of several techniques that can be used to examine qualitative outcomes. Generally, other techniques such as Logit regression yield similar results. For a detailed discussion, see G.S. Maddala, *Limited Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, 1983. Probit analysis is performed here using the "dprobit" command in the statistical program STATA.

disparities observed in the construction and architecture/engineering sector are substantially larger than those observed in the economy as a whole.

Table 15. Minority Group Business Formation Relative to Whites with Similar Personal Characteristics (Hourly Equivalents)

United States – All Industries

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-4.6% (88.70)	-2.9% (45.22)	n/a	n/a	-1.0% (11.55)	-4.7% (146.90)	2,810,390
1992-2002	-4.5% (66.50)	-3.9% (55.61)	-0.7% (6.84)	-2.2% (12.07)	n/a	-2.7% (66.26)	1,994,519
2000	n/a	n/a	n/a	n/a	n/a	n/a	n/a

State of Missouri – All Industries

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-5.0% (12.57)	-2.5% (1.94)	n/a	n/a	0.0% (0.01)	-4.9% (18.82)	43,903
1992-2002	-4.0% (6.62)	-3.4% (2.81)	-1.0% (0.55)	5.2% (2.03)	n/a	-1.8% (5.11)	24,799
2000	-4.0% (19.13)	-2.4% (6.05)	1.7% (2.82)	-0.8% (1.02)	-1.4% (2.86)	-2.4% (16.65)	135,070

MO-KC-STL – All Industries

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-4.6% (13.14)	-2.2% (2.00)	n/a	n/a	0.3% (0.30)	-4.5% (20.11)	52,244
1992-2002	-4.1% (9.05)	-2.5% (3.01)	1.2% (1.02)	3.2% (1.57)	n/a	-1.6% (5.82)	36,247
2000	-3.8% (20.77)	-2.8% (8.90)	1.2% (2.38)	-0.7% (0.91)	-1.4% (3.26)	-2.4% (19.35)	161,532

Notes: (1) Universe is all private sector workers 16 years and older; (2) Reported number is the percentage point difference in self-employment rates compared to white men; (3) Results are derived from Probit equations regressing (the natural logarithm of) hourly self-employment income age, age squared, educational attainment, industry, state, race and sex; (4) Number in parentheses is the absolute value of the

associated z-statistic. Z-statistics greater than 1.67 are statistically significant at a 90 percent confidence level. Z-statistics greater than 1.99 are significant at 95 percent confidence. Z-statistics greater than 2.64 are significant at 99 percent confidence; (5) An asterisk in place of a t-statistic indicates that, due to sample size limitations, the estimate was derived by including race- and sex-specific Missouri or MO-KC-STL interaction terms in the U.S. equations and that the given interaction was statistically significant. If the interaction was not statistically significant, the results from the corresponding U.S. regression are reported, since the U.S. and the Missouri or MO-KC-STL results are not statistically different; (6) Individuals with imputed earnings are excluded where identified; (7) For 1979-1991, "Other Race" includes Hispanics, Asian/Pacific Islanders, and American Indians/Alaska Natives. In 2000, "Other Race" includes persons identifying themselves as belonging in more than one racial category. For 1979-1991 and 1992-2002, "Female" includes all females regardless of race. For 2000, "Female" includes white females only.

Source: 2000: Five Percent PUMS; 1979-1991 and 1992-2002: Merged ORG files of the CPS.

Table 16. Minority Group Business Formation Relative to Whites with Similar Personal Characteristics (Hourly Equivalents)

United States – Construction and Architecture/Engineering

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-10.9%	-7.4%	n/a	n/a	-11.1%	-11.0%	216,421
	(28.70)	(16.68)			(18.68)	(37.90)	
1992-2002	-10.7%	-9.2%	-7.5%	-8.3%	n/a	-5.4%	158,023
	(22.59)	(21.08)	(8.70)	(8.78)		(16.12)	
2000	-8.8%	-8.5%	-7.0%	-7.6%	-3.0%	-9.0%	608,373
	(40.33)	(45.23)	(16.5)	(14.3)	(6.84)	(52.89)	

State of Missouri – Construction and Architecture/Engineering

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-10.4%	-7.1%	n/a	n/a	-10.6%	-10.4%	216,421
	(28.70)	(16.68)			(18.68)	(37.90)	
1992-2002	-10.7%	-9.2%	-7.5%	-8.3%	n/a	0.7%	158,023
	(22.59)	(21.08)	(8.70)	(8.78)		(*)	
2000	-10.4%	-9.5%	-3.9%	11.7%	5.7%	-3.3%	11,817
	(4.92)	(2.93)	(0.52)	(2.01)	(1.46)	(2.53)	

MO-KC-STL – Construction and Architecture/Engineering

	African American	Hispanic	Asian/ Pacific Isl.	Amer. Indian	Other Race	Female	Number of Obs.
1979-1991	-10.9%	-7.4%	n/a	n/a	-11.1%	-11.0%	216,421
	(28.70)	(16.68)			(18.68)	(37.90)	
1992-2002	-10.7%	-9.2%	-7.5%	-8.3%	n/a	3.0%	158,023
	(22.59)	(21.08)	(8.70)	(8.78)		(*)	
2000	-9.3%	-9.6%	-5.8%	12.0%	4.0%	-3.7%	14,072
	(5.11)	(3.74)	(0.95)	(2.24)	(1.13)	(3.14)	

Notes: (1) Universe is all private sector workers 16 years and older in the construction or architecture/engineering sector; (2) Reported number is the percentage point difference in self-employment rates compared to white men; (3) Results are derived from Probit equations regressing (the natural logarithm of) hourly self-employment income age, age squared, educational attainment, industry, state, race and sex; (4) Number in parentheses is the absolute value of the associated z-statistic. Z-statistics greater than 1.67 are statistically significant at a 90 percent confidence level. Z-statistics greater than 1.99 are significant at 95 percent confidence. Z-statistics greater than 2.64 are significant at 99 percent confidence; (5) An asterisk in place of a t-statistic indicates that, due to sample size limitations, the estimate was derived by including race- and sex-specific Missouri or MO-KC-STL interaction terms in the U.S. equations and that the given interaction was statistically significant. If the interaction was not statistically significant, the results from the corresponding U.S. regression are reported, since the U.S. and the Missouri or MO-KC-STL results are not statistically different; (6) Individuals with imputed earnings are excluded where identified; (7) For 1979-1991, "Other Race" includes Hispanics, Asian/Pacific Islanders, and American Indians/Alaska Natives. In 2000, "Other Race" includes persons identifying themselves as belonging in more than one racial category. For 1979-1991 and 1992-2002, "Female" includes all females regardless of race. For 2000, "Female" includes white females only.

Source: 2000: Five Percent PUMS; 1979-1991 and 1992-2002: Merged ORG files of the CPS.

D. Estimates of Adjusted DBE Availability

The Probit regression results for the MO-KC-STL construction and architecture/engineering sector from Table 16 are combined with weighted average self-employment rates by race and sex

from the 2000 PUMS (Table 14) to determine the expected difference between baseline availability and expected availability in a race-neutral marketplace. These figures appear in column (2) of Table 17 (below).

Table 17. Actual and Potential Business Formation Rates

Race/Sex	Business Formation Rate (%)	Potential Business Formation Rate (%)	Multiplier
	(1)	(2)	(3)
Black	13.91	23.21	1.669
Hispanic	12.86	22.46	1.747
Asian/Pacific Islander	11.70	17.50	1.496
American Indian/Alaska Native	28.47	16.47	n/a
Other Race	29.35	25.35	n/a
White female	19.21	22.91	1.193
All minority and female	18.13	24.00	1.324

Notes: Figures in column (1) are average self-employment rates weighted using PUMS population-based person weights. Figures in column (2) are derived from combining the figure in column (1) with the corresponding result from Table 16. Column (3) is simply column (2) divided by column (1).

Source: 2000: Five Percent PUMS.

Overall, the self-employment rate for minorities and women is 18.13 percent. According to the regression specification underlying Table 17, that rate would be 24.0 percent, or 32.4 percent higher, in a race and sex neutral marketplace.

Given the overall multiplier of 1.324 from the final row and column of Table 17, adjusted baseline estimates of DBE availability may be warranted to account for the continuing effects of discrimination, as directed by 49 CFR § 26.45(d)(1)(ii). It is important to note, however, that even the unadjusted baseline DBE availability figure is substantially higher than the average level of DBE utilization that MoDOT has achieved in recent fiscal years.[36] Finally, Table 18 presents estimates of baseline DBE availability and adjusted DBE availability for highway construction, engineering consulting, aviation construction, and for all MoDOT construction combined.

[36] Quarterly DBE reports submitted to USDOT between FFY1999 and FFY2003 show that overall DBE participation on federal-aid contracts (prime contractors and subcontractors) averaged approximately 9.4 percent—1.1 percent as prime contractors and 8.3% as subcontractors.

Table 18. Comparison of Baseline to Adjusted DBE Availability for MoDOT

Contracting Area	Baseline DBE Availability (%)	Adjusted DBE Availability (%)
Construction	17.52	23.20
Consulting	14.48	19.17
Off-Systems	16.39	21.70
TOTAL – All FEDERAL-AID PROJECTS	17.32	22.93

Source: (1) MoDOT contract databases; (2) Dun & Bradstreet's *MarketPlace*; (3) business directory information compiled by NERA; (4) NERA telephone surveys; and (5) the Five Percent 2000 PUMS.

VI. CONCLUSION

In this study, NERA estimated the availability of minority-owned and woman-owned businesses in MoDOT's contracting markets. This involved identifying the relevant markets for federally-assisted MoDOT contracting—that is, the main industries and localities where MoDOT spends its dollars. In consultation with MoDOT, NERA identified 66 distinct four-digit SIC codes in construction, 19 in consulting, and 22 in off-systems that account for the vast majority of contract, subcontract and supplier spending on MoDOT projects. We found that from 1997–2003, 87 percent of MoDOT's spending was with contractors located in MO-KC-STL, compared with 89 percent in consulting, and 99 percent in off-systems.

A further challenge was to count businesses in the relevant markets and determine the proportion that was owned by minorities and women. To count the number of businesses, we used Dun & Bradstreet's *MarketPlace* database to determine the total number operating in the relevant geographic and product markets. Unfortunately, *MarketPlace* does not adequately identify businesses owned by minorities and women. NERA took a number of steps to overcome this problem. First, we completed an intensive regional search for information on minority-owned and woman-owned businesses in and surrounding the MO-KC-STL area. Second, we conducted a survey to check whether the ownership status of these businesses was correct—some firms classified as DBEs were in fact not minority-owned and vice versa. We found that of the firms that were listed as DBEs, 18.2 percent, on average were wrongly classified and were actually owned by White males. A large number of businesses in the *MarketPlace* database did not have the race or gender of their owners identified. We conducted a second survey and found that 10.9 percent of these unclassified businesses, on average were actually owned by DBEs.

Once the relevant product markets had been established and we had an accurate estimate of the ownership status of the businesses in the database, we estimated final baseline DBE availability. Our final baseline estimates are 17.52 percent in construction, 14.48 percent in consulting, 16.39 percent in off-systems, and 17.32 percent overall. Finally, Step 2 adjustments were estimated using data from the 2000 Five Percent PUMS to take account of the fact that the baseline numbers are artificially lower than what would be expected in a race and sex neutral marketplace. Step 2 adjusted availability estimates are 23.20 percent for construction, 19.17 percent for consulting, 21.70 percent for off-systems, and 22.93 percent overall.